WHITE PINE BLISTER RUST CONTROL

IN THE

NORTHWESTERN REGION

* * *

January 1 to December 31, 1946

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United States Department of Agriculture
Bureau of Entomology and Plant Quarantine
Division of Plant Disease Control
Blister Rust Control
618 Realty Building
Spokane, Washington

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Herman E. Swanson, Regional Leader

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The 1946 blister rust control program in the Northwestern Region was organized along the same lines as in previous years. Agencies actively cooperating in the ribes eradication program are: Bureau of Entomology and Plant Quarantine, United States Forest Service, National Park Service, State of Idaho, and the Clearwater, Potlatch and Priest Lake Timber Protective Associations of North Idaho.

Progress. During 1946, a total of 56,372 acres were worked including 10,605 acres first working, 24,596 acres second and 21,171 acres third. While this represents a 10 per cent increase over 1945 accomplishments, several factors prevented greater progress and contributed to high operating costs. A shortage of qualified labor continued to be a handicap. Again, the loss of time by blister rust crews from project work to fight forest fires was particularly disrupting to the Forest Service program and caused a serious increase in blister rust control costs. To these handicaps was added the 40-hour work week for the first time since the WPA program. This short work week imposed upon a seasonal project which employs and trains a new field force each year and constructs temporary camps each season increased operating costs and slowed down progress. An analysis of the Bureau's program indicated that a 48-hour week in 1946 with time and a half pay for hours in excess of 40 per week would have made a saving of 26 per cent.

Labor. As during the war years, boys 16 years of age and older were the principal source of labor, although more adults and veterans accepted jobs than in previous years. Boys in the 16-year-old group were hired only to build up the camp quotas to full strength. The Forest Service used Mexican Nationals to a considerable extent. German internees and Civilian Public Service workers, an efficient type of labor on some units during the war, were not available in 1946. At the peak of the season, 2,518 workers in 55 camps were engaged on blister rust control in the Northwestern Region.

Infection Conditions. Blister rust infection was found on ribes near Teton Pass, west of Jackson, Wyoming. This discovery extended the known limits of the rust in this territory by 110 miles from Mammoth Hot Springs in the northwestern part of Yellowstone National Park.

Spread and intensification of the rust were very light in 1942, 1943 and 1944. Weather conditions in the late summer and fall of 1945 and 1946 were such to permit a build-up of the rust, but in neither year is this build-up expected to be as severe as in a wave year like 1941. In 1945, heavy ribes infection in the fall was not generally distributed, and any serious spread from ribes to pine was probably limited to certain parts of the region. In the fall of 1946 there was considerably more ribes infection throughout the region which may have spread to pine during the periods of suitable climatic conditions.

Methods. Ammonium sulfamate and 2,4-D in their respective fields replaced Atlacide in the treatment of ribes in stream type. Ammonium sulfamate is effective on both Ribes petiolare and R. lacustre which often occur together. Its use in such situations cuts labor costs about 30 per cent since the job is done in one operation, whereas only R. petiolare was killed with Atlacide, and R. lacustre had to be pulled by hand. Where R. petiolare occurs alone, 2,4-D is used, costing only 2 cents per gallon as against about 14 cents for other chemicals. Where chemical must be back-packed into remote areas, substantial labor savings are made since the amount of 2,4-D required is only 1/160 the weight of other chemicals necessary to do the same job. With the new developments in chemicals, power spraying equipment has been tested for extending this method of ribes eradication to upland areas. Four power units have been secured and are being mounted lower on the trucks to increase maneuverability in mountain areas.

The Division of Timber Management of the Forest Service in Region One extended the application of methods in timber cutting and stand improvement which are designed to reduce the ribes factor represented in living plants and stored seed. Timber marking rules in the white pine type for Region One are now being revised to incorporate these methods as standard practice. A conference of Forest Service timber sales men was held at the Deception Creek Experimental Forest to observe first hand the developments in timber management as related to blister rust control.

Summary of Progress

A summary of blister rust control activities in the Northwestern Region is presented in the following tables:

TABLE 1

SUMMARY OF RIBES ERADICATION BY STATES AND OPERATING AGENCIES - 1946

State	Operating Agency	First Working			Second Working			Other Workings			All Workings			Per Acre		Number of Camps	Total Seasonal Employees
		Acres	Ribes Destroyed	Man-Days	Acres	Ribes Destroyed	Man-Days	Acres	Ribes Destroyed	Man-Days	Acres	Ribes Destroyed	Man-Days	Ribes	Man-Days		
Idaho	BEPQ	3,762	877,392	4,482	14,604	366,389	10,436	11,662	417,980	9,884	30,028	1,661,761	24,802	55	.83	20	927
	FS	2,441	772,107	3,804	6,266	284,892	6,785	8,331	400,443	13,635	17,038	1,457,442	24,224	86	1.42	22	1,000
	Subtotal	6,203	1,649,499	8,286	20,870	651,281	17,221	19,993	813,423	23,519	47,066	3,119,203	49,026	66	1.04	42	1,927
Montana	FS	2,386	265,130	6,637	182	23,158	369	391	19,914	518	2,959	308,202	7,524	104	2.54	7	321
	NPS	88	42,967	651							88	42,967	651	488	7.40	1	30
	Subtotal	2,474	308,097	7,288	182	23,158	369	391	19,914	518	3,047	351,169	8,175	115	2.68	8	351
Washington	FS	1,481	889,143	3,840	3,392	127,636	1,896	787	27,426	785	5,660	1,044,205	6,521	184	1.15	4	213
Wyoming	NPS	447	87,806	701	152	6,394	67				599	94,200	768	157	1.28	1	27
All States	BEPQ	3,762	877,392	4,482	14,604	366,389	10,436	11,662	417,980	9,884	30,028	1,661,761	24,802	55	.83	20	927
	FS	6,308	1,926,380	14,281	9,840	435,686	9,050	9,509	447,783	14,938	25,657	2,809,849	33,269	110	1.49	33	1,534
	NPS	535	130,773	1,352	152	6,394	67				687	137,167	1,419	200	2.07	2	57
Total		10,605	2,934,545	20,115	24,596	808,469	19,553	21,171	865,763	24,822	56,372	4,608,777	64,490	82	1.14	55	2,518

TABLE 2

ACREAGE WORKED BY LAND OWNERSHIP - 1946

Land Ownership	First Working	Second Working	Other Workings	All Workings
	Acres	Acres	Acres	Acres
National Forest Region 1	5,867	11,687	11,079	28,633
National Park	535	152		687
Public Domain		10	324	334
State and Private	4,203	12,747	9,768	26,718
Total	10,605	24,596	21,171	56,372

TABLE 3

SUMMARY OF EXPENDITURES - FEDERAL AND COOPERATIVE - 1946

State	Cooperative Funds		Total Federal Funds	Total All Funds	Federal Funds				Cooperative Funds Direct Aid			Expenditures Ribes Eradication
	Total (Direct and Indirect Aid)	Direct Aid			Entomology and Plant Quarantine 3101	Entomology and Plant Quarantine 3103	Forest Service	Park Service	State	Private	Total	
Idaho	$42,595.00	$41,595.00	$1,060,344.40	$1,102,939.40	$101,834.22	$118,189.00 (I)297,690.93	$542,630.25		$14,943.35	$26,651.65	$41,595.00	$1,000,105.18
Mont.	1,000.00		198,963.45	199,963.45	13,758.79		172,730.78	$12,473.88				185,204.66
Wash.	1,000.00		166,046.84	167,046.84	12,060.13		152,844.00	1,142.71				152,844.00
Colo.	200.00		500.00	700.00	500.00							
Wyoming	200.00		14,690.14	14,890.14	3,858.81			10,831.33				10,831.33
Total	$44,995.00	$41,595.00	$1,440,544.83	$1,485,539.83	$132,011.95	$415,879.93	$868,205.03	$24,447.92	$14,943.35	$26,651.65	$41,595.00	$1,348,985.17

(I) Intermingled lands

TABLE A

STATUS OF RIBES ERADICATION BY STATES - ALL OWNERSHIPS, DECEMBER 31, 1946
Accumulative Series - Net

State	Total Acres		First Working		Second Working	Other Workings	On Maintenance		Remaining Work	
	White Pine	Control Area (Wh.P.& Prot.Zone)	Acres	Per Cent	Acres	Acres	Acres	Per Cent	Unworked Acres	Requiring Rework Acres
Idaho	2,254,664	2,254,664	1,508,088	67	384,117	98,481	477,537	21	746,576	1,030,551
Montana	212,781	212,781	138,371	65	14,405	5,543	62,824	30	74,410	75,547
Washington	152,964	152,964	113,205	74	42,026	18,220	35,444	23	39,759	77,761
Subtotal	2,620,409	2,620,409	1,759,664	67	440,548	122,244	575,805	22	860,745	1,183,859
Wyoming	230,778	230,778	23,774	10	152		10,225	4	207,004	13,549
Colorado	206,000	206,000	14,859	7	1,962		8,000	4	191,141	6,859
Subtotal	436,778	436,778	38,633	9	2,114		18,225	4	398,145	20,408
Total	3,057,187	3,057,187	1,798,297	59	442,662	122,244	594,030	19	1,258,890	1,204,267

TABLE B

SUMMARY OF STATUS OF RIBES ERADICATION BY LAND OWNERSHIP, DECEMBER 31, 1946
Accumulative Series - Net

Land Ownership	Total Acres		First Working		Second Working	Other Workings	On Maintenance		Remaining Work	
	White Pine	Control Area (Wh.P.& Prot.Zone)	Acres	Per Cent	Acres	Acres	Acres	Per Cent	Unworked Acres	Requiring Rework Acres
National Forests R-1	1,403,219	1,403,219	1,050,657	75	255,573	59,889	342,498	24	352,562	708,159
National Forests R-2 & 4	*421,000	*421,000	36,619	9	1,962		17,000	4	384,381	19,619
Subtotal	1,824,219	1,824,219	1,087,276	60	257,535	59,889	359,498	20	736,943	727,778
National Parks	24,087	24,087	9,236	38	5,894	7,158	6,875	29	14,851	2,361
Public Domain	29,409	29,409	16,717	57	5,990	1,690	5,509	19	12,692	11,208
Subtotal--Interior	53,496	53,496	25,953	49	11,884	8,848	12,384	23	27,543	13,569
Total--Federal	1,877,715	1,877,715	1,113,229	59	269,419	68,737	371,882	20	764,486	741,347
State & Private Lands	1,179,472	1,179,472	685,068	58	173,243	53,507	222,148	19	494,404	462,920
Total	3,057,187	3,057,187	1,798,297	59	442,662	122,244	594,030	19	1,258,890	1,204,267

*Indefinite

Cooperative Blister Rust Control on State and Private Lands in 1946

Blister rust control on state and private lands in 1946 was conducted by the Bureau of Entomology and Plant Quarantine in cooperation with the State of Idaho and the Clearwater, Potlatch and Priest Lake Timber Protective Associations. Part of the federal appropriations was earmarked for use where federal lands are intermingled with other lands. In view of the intermingled ownership existing in much of the forest land in north Idaho, the camps operating under these special funds could be located on high priority white pine sites within or near the Association boundaries.

The field project included 20 camps with a total of 927 workers. The camps and workers were distributed as follows: Clearwater, 7 camps, 295 workers; St. Joe (Potlatch), 7 camps, 357 workers; Kaniksu (Priest Lake), 6 camps, 275 workers. This substantial increase over the 1945 program of 429 workers was made possible by a large increase in federal appropriations.

In 1946, 30,038 acres were worked, much of which will go on maintenance as a result of the last working. On the other hand, control work was started on some high priority white pine lands which have recently been cut over which will require an average of three workings before protection is established.

Details on the cooperative work will be found in the Clearwater, St. Joe, and Kaniksu operational reports.

Results of the 1946 program and net progress on state and private lands are summarized in the following tabulations:

1. Allotments

	Fiscal Year 1946	Fiscal Year 1947
Federal		
State and Private Lands	$224,400.00	$361,011.00
Intermingled Lands		320,000.00
State of Idaho	15,000.00	15,000.00
Clearwater T.P.A.	6,416.58	6,422.40
Potlatch T.P.A.	5,262.40	5,420.30
Priest Lake T.P.A.	4,260.44	4,066.54
Total	$255,339.42	$711,920.24

2. Expenditures - Calendar Year 1946

Operation	State and Private	Federal (BLR-3-4)	Total
Clearwater	$13,738.85	$131,747.08	$145,485.93
St. Joe (Potlatch)	13,626.30	147,202.88	160,829.18
Kaniksu (Priest Lake)	14,229.85	136,929.97	151,159.82
Total	$41,595.00*	$415,879.93	$457,474.93

*State, $14,943.35; Private, $26,651.65. Cash expenditures, 1928-1946: State, $208,442.67; Private, $167,343.15; Total, $375,785.82.

3. Cooperative Ribes Eradication in Idaho, 1946

Operation	Acres Worked Initial	Acres Worked Rework	Acres Worked Total	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
Clearwater	1,813	3,786	5,599	7,614	1,036,693	1.36	185
St. Joe	59	8,091	8,150	8,947	251,691	1.10	31
Kaniksu	1,890	14,389	16,279	8,241	373,377	.51	23
Total	3,762	26,266	30,028	24,802	1,661,761	.83	55

4. State and Private Lands Worked in 1946

State	Acres Worked First	Acres Worked Second	Acres Worked Third	Total
Idaho	3,997	12,517	9,719	26,233
Montana	37	95	49	181
Washington	169	135	-	304
Total	4,203	12,747	9,768	26,718

5. Progress on State and Private Lands, 1923-1946 (Net Acres)

State	Acres Worked First	Acres Worked Second	Acres Worked Third	Acres Unworked	Total Acres in Control Area
Idaho	642,077	159,434	46,986	474,218	1,116,295
Montana	19,729	2,375	1,840	15,028	34,757
Washington	23,262	11,434	4,681	5,158	28,420
Total	685,068	173,243	53,507	494,404	1,179,472

Blister Rust Control on National Forests
Region One - 1946

Blister rust control work in 1946 was conducted by the Forest Service on six national forests along much the same lines as in 1945.

Shortage of labor prevented the Forest Service from building up to desired strength. At the peak of the season the project numbered 33 camps and 1,591 workers as against 35 camps and 1,843 workers in 1945. Boys 17 years and older were the principal source of labor although Mexican Nationals were again employed to augment the field force. War internees, who had been an important and efficient part of the field force during the war, were no longer available. The number of camps and workers on each forest were as follows:

National Forest	Camps	Workers
Clearwater	5	185
St. Joe	8	429
Coeur d'Alene	7	335
Kaniksu	6	264
Cabinet	3	153
Kootenai	4	168
Total	33	1,534

The 40-hour work week and the loss of time to fire combined to greatly impede progress and increase costs. These factors need correction as they are rendering blister rust control costs prohibitive on many areas as well as making it difficult to secure the efficiency necessary to control the rust.

The Division of Timber Management extended the application of practices, designed to eliminate or minimize the ribes factor represented in living plants or stored seed, on timber sale and stand improvement areas in the white pine type. The ecology of white pine and ribes was reviewed by the timber management men from the white pine forests at an October conference held at Deception Creek Experimental Forest. Marking rules for the white pine type are also being revised to incorporate these new practices.

The Forest Service initiated a study of the blister rust control situation in Region One. This study will involve a comprehensive analysis of the technical and economical aspects of the problem for the purpose of developing a Forest Service policy for the management of white pine in Region One. The study is being conducted by Mr. D. N. Matthews, Silviculturist, and Mr. S. Blair Hutchison, Forest Economist.

The following tabulations summarize the expenditures and progress of work on national forest lands:

1. Expenditures, 1946

Clearwater	$109,209.74
St. Joe	223,578.59
Coeur d'Alene	174,417.11
Kaniksu	188,268.81
Cabinet	91,826.00
Kootenai	80,904.78
Total	$868,205.03

2. Expenditures, 1930-1946

Forest	Regular	Emergency	Total
Clearwater	$1,045,462.67	$ 413,454.80	$1,458,917.47
St. Joe	2,066,573.65	383,340.06	2,449,913.71
Coeur d'Alene	1,135,117.45	669,809.81	1,804,927.26
Kaniksu	1,089,394.86	458,055.36	1,547,450.22
Cabinet	446,549.26	258,476.52	705,025.78
Kootenai	211,133.42	28,233.00	239,366.42
Total	$5,994,231.31	$2,211,369.55	$8,205,600.86

3. Ribes Eradication by Forest Service Crews, 1946

	Acres Worked					Per Acre	
Forest	Initial	Rework	Total	Man-Days	Ribes	Man-Days	Ribes
Clearwater	1,319	3,657	4,976	4,588	236,343	.92	47
St. Joe	262	5,087	5,349	10,586	535,942	1.98	100
Coeur d'Alene	499	4,153	4,652	7,557	426,018	1.62	92
Kaniksu	1,842	5,879	7,721	8,014	1,303,344	1.04	169
Cabinet	601	438	1,039	4,432	194,900	4.27	188
Kootenai	1,785	135	1,920	3,092	113,302	1.61	59
Total	6,308	19,349	25,657	38,269	2,809,849	1.49	110

4. Ribes Eradication on National Forest Lands, 1923-1946

	Net Acres Worked			Acres	Total
Forest	First	Second	Third	Unworked	Acres
Clearwater	151,457	51,540	8,768	48,895	200,352
St. Joe	215,199	79,101	24,470	97,009	312,208
Coeur d'Alene*	307,070	49,431	12,972	53,976	361,046
Kaniksu	261,970	65,673	10,623	94,387	356,357
Cabinet	62,976	7,801	2,901	11,050	74,026
Kootenai	51,985	2,027	155	47,245	99,230
Total	1,050,657	255,573	59,889	352,562	1,403,219

*Includes 310 acres first working and 80 acres unworked on Mount Spokane operation.

Blister Rust Control on National Parks in 1946

Ribes eradication in 1946 was conducted by the National Park Service on Glacier and Yellowstone National Parks. The work on Mount Rainier was limited to checking the control areas to determine the needs for future work. Separate reports have been prepared for the work on each Park.

An inspection was made of conditions in Rocky Mountain National Park to determine the feasibility of undertaking control work on selected areas. The results of this inspection are presented in a Memorandum to the Regional Director, Region Two, dated November 1, 1946, prepared by Frank W. Childs, Regional Forester. Briefly, it appears that of the areas examined the Longs Peak-Estes Cone area would warrant the cost of blister rust control and that a survey should be conducted to determine the extent of the area to be worked and the estimated man-days required to establish protection.

Scouting revealed blister rust infection on ribes near Teton Pass, west of Jackson, Wyoming. This extended the known limits of blister rust in this region by 110 miles. Previously it had been found at Mammoth Hot Springs, Yellowstone National Park. A summary of the scouting work in Yellowstone and Grand Teton National Parks prepared by C. M. Chapman, Pathologist, follows this report.

The following tabulations summarize the expenditures and progress of work on National Parks in the Northwestern Region:

1. Expenditures by National Park Service

National Park	Calendar Year 1946	All Years
Mount Rainier	$ 1,142.71	$ 80,674.26
Glacier	12,473.88	23,623.44
Yellowstone	10,831.33	16,550.26
Total	$24,447.92	$120,847.96

2. Ribes Eradication on National Parks, 1946

	Acres Worked					Per Acre	
National Park	First	Second	Total	Man-Days	Ribes	Man-Days	Ribes
Glacier	88		88	651	42,967	7.40	488
Yellowstone	447	152	599	768	94,200	1.28	157
Total	535	152	687	1,419	137,167	2.07	200

3. Gross Acreage Worked on National Parks, 1930-1946

	Acres Worked						Per Acre	
National Park	First	Second	Third and Other	Total	Man-Days	Ribes	Man-Days	Ribes
Mount Rainier	8,254	4,327	6,731	19,312	22,051	2,242,619	1.14	116
Glacier	3,641	2,202	647	6,490	6,833	740,725	1.05	114
Yellowstone	2,014	152		2,166	1,760	189,969	.81	88
Total	13,909	6,681	7,378	27,968	30,644	3,173,313	1.10	113

4. Work Status in Net Control Area

National Park	Acres Worked First	Second	Third and Other	Acres on Maintenance	Acres Unworked	Total Acres Control Area
Mount Rainier	3,581	3,540	6,511	3,000	-	3,581
Glacier	3,641	2,202	647	2,650	1,087	4,728
Yellowstone	2,014	152	-	1,225	6,764	8,778*
Rocky Mountain	-	-	-	-	7,000	7,000*
Total	9,236	5,894	7,158	6,875	14,851	24,087

*Estimate

SCOUTING FOR BLISTER RUST
IN YELLOWSTONE AND GRAND TETON NATIONAL PARKS, WYOMING
By
C. M. Chapman, Pathologist

Limited sampling of ribes and pine in Yellowstone and Grand Teton National Parks, Wyoming, and vicinity in 1946 was confined to the more favorable spots for blister rust development.

The sampling showed six infections on ribes in the vicinity of Mammoth Hot Springs, Yellowstone National Park, Wyoming, and one infection on ribes near Teton Pass, west of Jackson, Wyoming, in the Teton National Forest.

Blister rust was found for the first time in Yellowstone National Park near Mammoth Hot Springs in 1944 on two *Ribes petiolare* bushes and again on the same area in 1945 on five *R. petiolare* bushes and one *R. setosum* bush. In 1946, 16 *R. petiolare* bushes and two *R. setosum* bushes were infected on the same area but outside the blister rust control protection zone. The 18 infected bushes found in 1946 were located within two to six miles of Mammoth Hot Springs, as follows:

Eagle Creek, three *R. petiolare*, sec. 13, T. 9 S., R. 8 E. Gallatin National Forest, Park County, Montana.

Slide Lake Creek, seven *R. petiolare*, sec. 35, T. 9 S., R. 8 E. Yellowstone National Park, Park County, Montana.

Gardiner River, one *R. petiolare*, sec. 12, T. 10 S., R. 8 E. Yellowstone National Park, Wyoming.

Lava Creek, two *R. petiolare* and one *R. setosum*, sec. 19, T. 10 S., R. 9 E. Yellowstone National Park, Wyoming.

Glen Creek, two *R. petiolare* and one *R. setosum*, sec. 26, T. 10 S., R. 8 E. Yellowstone National Park, Wyoming.

Clematis Gulch, one *R. petiolare*, sec. 15, T. 10 S., R. 8 E. Yellowstone National Park, Wyoming.

The increase of rust on ribes in the Mammoth area from 1944 to 1946 would indicate that rust is present on white pine in the vicinity of Mammoth Hot Springs, Yellowstone National Park, Wyoming.

The infection on ribes near Teton Pass, west of Jackson, Wyoming, consists of three *R. petiolare* bushes in sec. 19, T. 41 N., R. 17 W. and is located east of Teton Pass on Trail Creek in the Teton National Forest, Teton County, Wyoming. The infection on the three bushes was light and may be a long-distance spread of the rust from infected pine in Idaho.

Inspections of ribes and pine for blister rust were made at the following locations:

Teton National Forest, Wyoming:

Mail Cabin, Trail, Buffalo, Pacific, Pilgrim and Dime Creeks, and on the Divide at Teton Pass.

Grand Teton National Park, Wyoming:

Taggert, Cascade, and Glacier Creeks and small side streams on west side of Jenny Lake.

Yellowstone National Park, Wyoming:

West Thumb, Craig Pass, Old Faithful, Norris, Madison River, Gibbon River, Grebe Lake, Glen Creek, Clematis Gulch, Slide Lake, Gardiner River, Reese, Lava and Elk Creeks, Lamar River, Tower Falls, and Mount Washburn.

Gallatin National Forest, Montana:

Eagle Creek and Yellowstone River.

Identifications of blister rust on ribes were made by the Bureau of Plant Industry, Division of Forest Pathology, San Francisco, California.

BLISTER RUST CONTROL, INLAND EMPIRE, 1946

By

Frank O. Walters

Assistant Regional Leader

Organization. The valuable white pine lands of eastern Washington, western Montana, and northern Idaho comprise the Inland Empire section of the Northwestern Region. This section is in turn broken down into five administrative units as follows:

1. Clearwater Operation
2. St. Joe Operation
3. Coeur d'Alene Operation
4. Kaniksu Operation
5. Montana Operation (Kootenai and Cabinet National Forests)

The Coeur d'Alene and Montana operations are largely of Federal ownership. The other operations, in addition to the Federal lands, have large areas of State, private, and intermingled Federal lands. Most of these lands are included in the following three Timber Protective Associations: (1) Clearwater, (2) Potlatch, and (3) Priest Lake.

A Forest Service staff man administers the work of the Forest Service on its lands. A Bureau representative is assigned to each operation to direct the checking, disease, and classification surveys, and to afford technical advice to the Forest Service on matters relating to blister rust control. On operations where other than Federal lands are involved, the Bureau administers the ribes eradication activities on these lands.

Labor. With the cessation of hostilities and the closing of war industries, it was anticipated that a supply of efficient labor would be available. Such was not the case, and it was again necessary to depend largely on teen-age boys for labor. On the Kaniksu, St. Joe, and Cabinet Forests, Mexican Nationals were used on heavy work areas. A greater number of older, experienced men were available for overhead than at any time since 1942. This was a material help in providing supervision for the young workers.

Factors Contributing to Increased Costs and Inefficiency. Principal factors which contribute to unsatisfactory progress and increased costs are: (1) short season, (2) 40-hour week, (3) interference from fire, and (4) inefficient labor. Because of the large number of high school students employed, the field season extended only from mid-June to mid-August. By the time the men were fully trained, only six weeks of effective work was possible. The cost of establishing and dismantling camps is just as great as though a 4-month season were worked. The five-day week not only materially reduces the number of work days, but causes dissatisfaction on the part of the men. With two unpaid days each week, when the men are idle around camp and board is charged, they become restless and resentful. This situation was an important contributing factor to the large labor turnover. The greatest demand for blister rust crews for fire

fighting usually occurs in August, when the crews are at peak efficiency. This year nearly two weeks of working time were lost because of fire. Highly efficient labor is a necessity to secure the required quality of work to place the many areas of light ribes on maintenance.

Accomplishments. With more and better supervisory personnel and a better understanding of how to handle the teen-age worker, it was possible to show an increase in accomplishments over the past few years, as indicated by the following figures:

Year	Acres	Man-Days
1946	55,685	63,071
1945	46,504	62,619
1944	36,624	48,760
1943	35,934	44,757

Current Year's Work. On the Clearwater operation the Forest Service crews worked in pole stands in Rhoads, French, Tamarack, and Deadwood drainages. The Bureau camps located on lands administered by the Clearwater Timber Protective Association worked on cutover lands on which white pine is reproducing abundantly.

The Forest Service camps on the St. Joe operation carried on work in plantation areas near Emida and advance reproduction and pole stands near Clarkia. The Bureau operated largely on the extensive double burn areas in the vicinity of Elk River and Bovill. These areas, once considered devastated, are rapidly becoming completely stocked from seed supplied by scattered reproduction and pole trees.

The Coeur d'Alene operation continued protection work on the extensive 1925 plantations in the vicinity of Jordan Creek. Work was also done on the pole and reproduction areas on the north fork of the Coeur d'Alene river.

On the Kaniksu operation the Forest Service worked on the large plantation area in the Kalispell basin and Lamb Creek. Protection was also given to most of the pole stand in the Upper West Branch. The Bureau operated in the extensive blocks of pole and advance reproduction in the Trapper Creek and Pack River Drainages.

In Montana the Kootenai Forest gave additional protection to the pole stands in the Yaak River drainage. The Cabinet Forest worked on the 1924 plantation in the Middle Fork and the 1919 plantation in the West Fork of Big Creek. All work was on areas of high priority.

Status of Work. Most of this year's eradication activities represented second and third workings. On extensive areas the number of ribes per acre has been reduced to a low figure. Additional workings are needed to place many of these areas on a maintenance basis. More area was placed in a maintenance status as a result of this season's work than has been possible for some time.

Surveys. With more qualified checkers available, it was possible to check practically all areas worked. In addition, post-check data were secured on many areas where this information was badly needed.

A wide use was made of the checker-flanker method, both as an eradication measure on areas with few ribes and as a means to determine the actual status of ground being considered for maintenance.

The disease survey work was expanded on all operations, but fell far short of supplying the amount of information needed. Pine stocking surveys were run on the St. Joe and Coeur d'Alene operations.

Needs. The following points are mentioned as the most pressing needs in facilitating the work in future years:

1. Adoption of the 48-hour week.
2. A nucleus of highly-skilled workers to work as individuals on areas of light ribes concentration.
3. A more mature and efficient class of labor.
4. An expansion of post check and disease surveys to furnish vital data to implement planning for future work.
5. A stabilized, consistent program, so that definite long-range plans can be worked out with confidence of ultimate consummation.

The statement of expenditures and costs is shown in the following tables by the cooperative agency and the type of appropriation:

TABLE 1

EXPENDITURES BY APPROPRIATIONS IN INLAND EMPIRE, 1946

Cooperating Agency	Appropriation	Amount
Bureau of Entomology & Plant Quarantine	Regular BLR-1-4	$ 72,522.67
	Regular BLR-3-4	415,879.93
	Subtotal	$ 488,402.60
State of Idaho	State BLR-3-4	$ 14,943.35
Timber Protective Associations	Private BLR-3-4	26,651.65
	Subtotal	$ 41,595.00
Forest Service	Regular BLR-4	$ 868,205.03
Total		$1,398,202.63

TABLE 2

CLASSIFIED EXPENDITURES IN INLAND EMPIRE, 1946

Item	Bureau of Entomology and Plant Quarantine				Forest Service	Total
	Regular BLR-1-4	Regular BLR-3-4	State and Private BLR-3-4	Total	Regular BLR-4	
Sal. perm. men	$54,048.53	$ 6,408.94		$ 60,457.47	$ 63,790.02	$ 124,247.49
Sal. temp. men	1,743.84	76,554.42	$ 4,128.32	82,426.58	77,841.71	160,268.29
Wages, temp. labs.	6,806.94	206,976.15	36,390.37	250,173.46	496,831.05	747,004.51
Subs. supplies	2,616.54	70,674.07	1,076.31	74,366.92	141,189.23	215,556.15
Equipment	9.85	15,861.15		15,871.00	39,647.27	55,518.27
Trucks		8,551.12		8,551.12		8,551.12
Travel & trans.	2,617.20	7,929.64		10,546.84	25,779.84	36,326.68
Other supplies	4,679.77	22,924.44		27,604.21	23,125.91	50,730.12
Total	$72,522.67	$415,879.93	$41,595.00	$529,997.60	$868,205.03	$1,398,202.63

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
INLAND EMPIRE

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
First	Burn	1945-49	243	548	111,750	2.26	460
	Cutover	1940-44	2,752	3,063	950,049	1.11	345
	Cutover	1920-39	1,366	2,601	229,334	1.90	168
	Reproduction	1910-39	2,021	7,635	1,034,668	3.78	512
	Pole		2,168	1,999	75,198	.92	35
	Mature		688	324	16,459	.47	24
	Miscellaneous		343	690	294,813	2.01	860
	Stream (1)		489	1,930	91,501	3.95	187
	Total		10,070	18,790	2,803,772	1.87	278
Second	Cutover	1940-44	80	74	4,208	.93	53
	Plantation	1940-44	426	471	7,137	1.11	17
	Cutover	1920-39	1,923	2,576	121,675	1.34	63
	Reproduction	1910-39	8,333	10,525	423,891	1.26	51
	Pole		10,573	3,166	128,403	.30	12
	Mature		612	486	14,611	.79	24
	Miscellaneous		248	123	2,329	.50	9
	Stream (2)		2,249	2,065	99,821	.92	44
	Total		24,444	19,486	802,075	.80	33
Third	Plantation	1940-44	211	35	1,258	.17	6
	Cutover	1920-39	5,780	5,810	345,274	1.01	60
	Reproduction	1910-39	9,231	13,770	268,466	1.49	29
	Pole		2,804	1,416	60,055	.50	21
	Mature		576	349	54,777	.61	95
	Miscellaneous		416	128	3,382	.31	8
	Stream (3)		2,153	3,314	132,551	1.54	62
	Total		21,171	24,822	865,763	1.17	41
All Workings	Burn	1945-49	243	548	111,750	2.26	460
	Cutover	1940-44	2,832	3,110	954,257	1.10	337
	Plantation	1940-44	637	506	8,395	.79	13
	Cutover	1920-39	9,069	10,987	696,283	1.21	77
	Reproduction	1910-39	19,585	31,930	1,727,025	1.63	88
	Pole		15,545	6,581	263,656	.42	17
	Mature		1,876	1,159	85,847	.62	46
	Miscellaneous		1,007	941	300,524	.93	298
	Stream (4)		4,891	7,309	323,873	1.49	66
	Total		55,685	63,071	4,471,610	1.13	80

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	26	82	1,576
(2)	20	39	521
(3)	1,536	2,247	9,417
(4)	1,582	2,368	11,514

TABLE 4

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1946
INLAND EMPIRE

State	Working	Class	Acres	Man-Days	Ribes	Gallons Spray	Per Acre Man-Days	Per Acre Ribes
Idaho	First	EQ-Coop.	3,762	4,482	877,392	21	1.19	233
		FS-Reg.	2,441	3,804	772,107	755	1.56	316
		Total	6,203	8,286	1,649,499	776	1.34	266
	Second	EQ-Coop.	14,604	10,436	366,389	246	.71	25
		FS-Reg.	6,266	6,785	284,892		1.08	45
		Total	20,870	17,221	651,281	246	.83	31
	Third	EQ-Coop.	11,662	9,884	417,980	5,716	.85	36
		FS-Reg.	8,331	13,635	400,443	3,231	1.64	48
		Total	19,993	23,519	818,423	8,947	1.18	41
	All Workings	EQ-Coop.	30,028	24,802	1,661,761	5,983	.83	55
		FS-Reg.	17,038	24,224	1,457,442	3,986	1.42	86
		Total	47,066	49,026	3,119,203	9,969	1.04	66
Montana	First	FS-Reg.	2,386	6,637	265,130	800	2.78	111
	Second	FS-Reg.	182	369	23,158	275	2.03	127
	Third	FS-Reg.	391	518	19,914	470	1.32	51
	All Workings	FS-Reg.	2,959	7,524	308,202	1,545	2.54	104
Washington	First	FS-Reg.	1,481	3,840	889,143		2.59	600
	Second	FS-Reg.	3,392	1,896	127,636		.56	38
	Third	FS-Reg.	787	785	27,426		1.00	35
	All Workings	FS-Reg.	5,660	6,521	1,044,205		1.15	184
Total	First	EQ-Coop.	3,762	4,482	877,392	21	1.19	233
		FS-Reg.	6,308	14,281	1,926,380	1,555	2.26	305
		Total	10,070	18,763	2,803,772	1,576	1.86	278
	Second	EQ-Coop.	14,604	10,436	366,389	246	.71	25
		FS-Reg.	9,840	9,050	435,686	275	.92	44
		Total	24,444	19,486	802,075	521	.80	33
	Third	EQ-Coop.	11,662	9,884	417,980	5,716	.85	36
		FS-Reg.	9,509	14,938	447,783	3,701	1.57	47
		Total	21,171	24,822	865,763	9,417	1.17	41
	All Workings	EQ-Coop.	30,028	24,802	1,661,761	5,983	.83	55
		FS-Reg.	25,657	38,269	2,809,849	5,531	1.49	110
		Total	55,685	63,071	4,471,610	11,514	1.13	80

TABLE 5

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
INLAND EMPIRE

State	Working	Number of Acres Worked																	
		By Forest Service					By Bureau of Entomology and Plant Quarantine					Total							
												Federal			Other				
		National Forest	Public Domain	State	Private	Total	National Forest	Public Domain	State	Private	Total	National Forest	Public Domain	Total	State	Private	Total	Total
Idaho	First	2,184			257	2,441	22		1,951	1,789	3,762	2,206		2,206	1,951	2,046	3,997	6,203
	Second	5,789		37	440	6,266	2,554	10	6,022	6,018	14,604	8,343	10	8,353	6,059	6,458	12,517	20,870
	Third	7,182	123	557	469	8,331	2,768	201	3,602	5,091	11,662	9,950	324	10,274	4,159	5,560	9,719	19,993
	Total	15,155	123	594	1,166	17,038	5,344	211	11,575	12,898	30,028	20,499	334	20,833	12,169	14,064	26,233	47,066
Montana	First	2,349			37	2,386						2,349		2,349		37	37	2,386
	Second	87			95	182						87		87		95	95	182
	Third	342			49	391						342		342		49	49	391
	Total	2,778			181	2,959						2,778		2,778		181	181	2,959
Washington	First	1,312			169	1,481						1,312		1,312		169	169	1,481
	Second	3,257			135	3,392						3,257		3,257		135	135	3,392
	Third	787				787						787		787				787
	Total	5,356			304	5,660						5,356		5,356		304	304	5,660
Total	First	5,845			463	6,308	22		1,951	1,789	3,762	5,867		5,867	1,951	2,252	4,203	10,070
	Second	9,133		37	670	9,840	2,554	10	6,022	6,018	14,604	11,687	10	11,697	6,059	6,688	12,747	24,444
	Third	8,311	123	557	518	9,509	2,768	201	3,602	5,091	11,662	11,079	324	11,403	4,159	5,609	9,768	21,171
	Total	23,289	123	594	1,651	25,657	5,344	211	11,575	12,898	30,028	23,633	334	23,967	12,169	14,549	26,718	55,685

TABLE 6

RIBES SPECIES ERADICATED, 1946
INLAND EMPIRE

Working	Eradication Type	Acres	Ribes Species						Total Ribes
			Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes inerme	Ribes irriguum	Ribes trista	
First	Burn (1945-49)	243	11,990	99,760					111,750
	Cutover (1940-44)	2,752	114,576	831,257	4,216				950,049
	Cutover (1920-39)	1,366	169,654	57,740	1,940				229,334
	Reproduction (1910-39)	2,021	461,759	572,889			20		1,034,668
	Pole	2,168	70,587	2,310	2,301				75,198
	Mature	688	15,518	941					16,459
	Miscellaneous	343	16,266	278,417		130			294,813
	Stream	489	78,043	3,451	7,820	836	1,351		91,501
	All Types	10,070	938,393	1,846,765	16,277	966	1,371		2,803,772
Second	Cutover (1940-44)	80	2,107	1,520	581				4,208
	Plantation (1940-44)	426	2,511	4,626					7,137
	Cutover (1920-39)	1,923	63,405	57,569	701				121,675
	Reproduction (1910-39)	8,333	323,486	76,174	823	23,323		35	423,891
	Pole	10,573	83,855	41,688	691	2,169			128,403
	Mature	612	12,846	1,755	10				14,611
	Miscellaneous	248	690	1,639					2,329
	Stream	2,249	65,170	437	6,505	27,709			99,821
	All Types	24,444	554,070	185,408	9,361	53,201		35	802,075
Third	Plantation (1940-44)	211	147	1,111					1,258
	Cutover (1920-39)	5,780	127,594	215,678	2,002				345,274
	Reproduction (1910-39)	9,231	147,494	119,042	1,930				268,466
	Pole	2,804	25,804	34,102	130	19			60,055
	Mature	576	13,878	40,899					54,777
	Miscellaneous	416	2,298	1,084					3,382
	Stream	2,153	35,600	2,815	90,456	1,054		2,626	132,551
	All Types	21,171	352,815	414,731	94,518	1,073		2,626	865,763
All Workings	Burn (1945-49)	243	11,990	99,760					111,750
	Cutover (1940-44)	2,832	116,683	832,777	4,797				954,257
	Plantation (1940-44)	637	2,658	5,737					8,395
	Cutover (1920-39)	9,069	360,653	330,987	4,643				696,283
	Reproduction (1910-39)	19,585	932,739	768,105	2,803	23,323	20	35	1,727,025
	Pole	15,545	180,246	78,100	3,122	2,188			263,656
	Mature	1,876	42,242	43,595	10				85,847
	Miscellaneous	1,007	19,254	281,140		130			300,524
	Stream	4,891	178,813	6,703	104,781	29,599	1,351	2,626	323,873
	All Types	55,685	1,845,278	2,446,904	120,156	55,240	1,371	2,661	4,471,610

TABLE 7

SUMMARY OF RIBES ERADICATION, 1923-1946
INLAND EMPIRE

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes	Net Acreage Remaining Worked	Net Acreage Remaining Unworked
First	Burn	1945-49	243	548	111,750	2.26	460	243	
	Plantation	1945-49	989	545	16,607	.55	17	989	473
	Cutover	1945-49							3,758
	Cutover	1940-44	9,555	12,017	5,004,528	1.26	524	9,555	126,436
	Burn	1940-44	926	535	100,985	.58	109	926	246
	Plantation	1940-44	5,892	8,232	2,183,197	1.40	371	5,892	227
	Cutover	1920-39	84,079	82,031	24,677,704	.98	294	79,682	243,502
	Reproduction	1910-39	602,368	677,446	182,936,952	1.12	304	591,907	165,061
	Pole		363,891	155,334	28,003,242	.43	77	359,242	94,671
	Mature		708,405	298,652	63,253,113	.42	89	546,414	191,287
	Miscellaneous		36,819	32,379	8,405,919	.88	228	34,114	9,790
	Stream (1)		124,458	313,514	64,639,421	2.52	519	123,478	24,207
	Total		1,937,625	1,581,233	379,333,418	.82	196	1,752,442	859,658
Second	Cutover	1940-44	432	273	11,315	.63	26	432	
	Plantation	1940-44	4,452	4,221	252,823	.95	57	4,452	
	Cutover	1920-39	54,147	60,334	13,149,748	1.11	243	54,147	
	Reproduction	1910-39	185,173	224,666	22,097,077	1.21	119	183,456	
	Pole		91,545	51,377	4,564,107	.56	50	90,818	
	Mature		43,296	27,652	2,972,347	.64	69	39,326	
	Miscellaneous		4,446	5,298	882,709	1.19	199	4,446	
	Stream (2)		58,120	89,753	12,099,170	1.54	208	57,729	
	Total		441,611	463,574	56,029,296	1.05	127	434,806	
Third	Plantation	1940-44	966	1,254	64,912	1.30	67	966	
	Cutover	1920-39	23,871	28,415	1,891,523	1.19	79	23,871	
	Reproduction	1910-39	57,040	81,284	3,356,315	1.43	59	56,433	
	Pole		11,108	7,090	439,063	.64	40	11,108	
	Mature		3,080	2,488	272,218	.81	88	3,080	
	Miscellaneous		976	467	30,828	.48	32	976	
	Stream (3)		18,652	28,041	2,546,372	1.50	137	18,652	
	Total		115,693	149,039	8,601,231	1.29	74	115,086	
Total	Burn	1945-49	243	548	111,750	2.26	460	243	
	Plantation	1945-49	989	545	16,607	.55	17	989	
	Cutover	1940-44	9,987	12,290	5,015,843	1.23	502	9,987	
	Burn	1940-44	926	535	100,985	.58	109	926	
	Plantation	1940-44	11,310	13,707	2,500,932	1.21	221	11,310	
	Cutover	1920-39	162,097	170,780	39,718,975	1.05	245	157,700	
	Reproduction	1910-39	844,581	983,396	208,390,344	1.16	247	831,796	
	Pole		466,544	213,801	33,006,412	.46	71	461,168	
	Mature		754,781	328,792	66,497,678	.44	88	588,820	
	Miscellaneous		42,241	38,144	9,319,456	.90	221	39,536	
	Stream (4)		201,230	431,308	79,284,963	2.14	394	199,859	
	Total		2,494,929	2,193,846	443,963,945	.88	178	2,302,334	

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	23,164	54,908	1,523,656
(2)	9,318	13,291	243,315
(3)	3,654	4,725	52,137
(4)	36,136	72,924	1,819,108

TABLE 8

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1923-1946
INLAND EMPIRE

State	Class	Gross Acres	Effective Man-Days	Total Ribes	Gallons Spray	Per Acre Basis	
						Man-Days	Ribes
Idaho	EQ-Reg.	48,984	20,468	5,042,300	79,864	.42	103
	EQ-Coop.	240,709	144,741	22,869,647	205,019	.60	95
	EQ-Emerg.	514,942	404,100	96,874,569	213,935	.78	188
	FS-Reg.	429,809	470,191	83,318,036	463,205	1.09	194
	FS-Emerg.	337,869	216,240	56,636,775	125,491	.64	168
	CCC	590,414	661,693	123,729,240	657,303	1.12	210
	Total	2,162,727	1,917,433	388,470,567	1,744,817	.89	180
Montana	EQ-Reg.	2,002	3,295	761,710	34,795	1.65	380
	EQ-Emerg.	66,076	30,787	5,775,415	1,330	.47	87
	FS-Reg.	37,792	46,693	4,183,558	10,203	1.24	111
	FS-Emerg.	35,712	35,620	7,367,723	21,638	1.00	206
	CCC	14,475	12,440	1,472,009	6,325	.86	102
	Total	156,057	128,835	19,560,415	74,291	.83	125
Washington	EQ-Emerg.	64,757	63,140	17,825,782		.98	275
	FS-Reg.	52,694	45,347	10,606,688		.86	201
	FS-Emerg.	36,366	14,386	4,013,260		.40	110
	CCC	22,328	24,705	3,487,233		1.11	156
	Total	176,145	147,578	35,932,963		.84	204
Idaho Montana Washington	EQ-Reg.	50,986	23,763	5,804,010	114,659	.47	114
	EQ-Coop.	240,709	144,741	22,869,647	205,019	.60	95
	EQ-Emerg.	645,775	498,027	120,475,766	215,265	.77	187
	FS-Reg.	520,295	562,231	98,108,282	473,408	1.08	189
	FS-Emerg.	409,947	266,246	68,017,758	147,129	.65	166
	CCC	627,217	698,838	128,688,482	663,628	1.11	205
	Total	2,494,929	2,193,846	443,963,945	1,819,108	.88	178

TABLE 9

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1923-1946
INLAND EMPIRE

State	Ownership	Net Acres in Control Area					
		Acres Worked				Acres Unworked	Total Acres
		First	Second	Third	Total		
Idaho	National Forest	849,649	218,753	49,805	1,118,207	259,666	1,109,315
	Public Domain	16,362	5,930	1,690	23,982	12,692	29,054
	Subtotal Federal	866,011	224,683	51,495	1,142,189	272,358	1,138,369
	State	229,109	58,121	18,711	305,941	119,118	348,227
	Private	412,968	101,313	28,275	542,556	355,100	769,068
	Subtotal Other	642,077	159,434	46,986	848,497	474,218	1,116,295
	Total	1,508,088	384,117	98,481	1,990,686	746,576	2,254,664
Montana	National Forest	114,961	9,828	3,056	127,845	58,295	173,256
	Public Domain	40			40		40
	Subtotal Federal	115,001	9,828	3,056	127,885	58,295	173,296
	State	734	1		735	173	907
	Private	18,995	2,374	1,840	23,209	14,855	33,850
	Subtotal Other	19,729	2,375	1,840	23,944	15,028	34,757
	Total	134,730	12,203	4,896	151,829	73,323	208,053
Washington	National Forest	86,047	26,992	7,028	120,067	34,601	120,648
	Public Domain	315	60		375		315
	Subtotal Federal	86,362	27,052	7,028	120,442	34,601	120,963
	State	6,832	3,935	2,114	12,881	988	7,820
	Private	16,430	7,499	2,567	26,496	4,170	20,600
	Subtotal Other	23,262	11,434	4,681	39,377	5,158	28,420
	Total	109,624	38,486	11,709	159,819	39,759	149,383
Total	National Forest	1,050,657	255,573	59,889	1,366,119	352,562	1,403,219
	Public Domain	16,717	5,990	1,690	24,397	12,692	29,409
	Subtotal Federal	1,067,374	261,563	61,579	1,390,516	365,254	1,432,628
	State	236,675	62,057	20,825	319,557	120,279	356,954
	Private	448,393	111,186	32,682	592,261	374,125	822,518
	Subtotal Other	685,068	173,243	53,507	911,818	494,404	1,179,472
	Total	1,752,442	434,806	115,086	2,302,334	859,658	2,612,100

BLISTER RUST CONTROL WORK, CLEARWATER OPERATION, 1946

By

F. J. Heinrich, Operation Supervisor
H. J. Faulkner, Assistant Operation Supervisor
B. C. Amsbaugh, Forest Officer

INTRODUCTION

The control area on the Clearwater operation comprises 488,000 acres of white pine type of which 205,000 acres fall within the national forest boundary and the remaining 283,000 acres lie within the boundaries of the Clearwater Timber Protective Association. The total area includes 43 per cent mature, 7 per cent pole, 15 per cent reproduction, 21 per cent cutover and 14 per cent stream and minor eradication types.

During the 18 years of ribes eradication work, 353,324 acres have been given first working, 107,900 acres second and 23,213 acres third. Out of the total area covered, approximately 90,000 acres have been placed in the maintenance classification.

ORGANIZATION AND ADMINISTRATION

Organization of field activities was the same as during the 1945 season with no change in previous working agreements with cooperating agencies.

Blister rust control field organization for the 1946 season was as follows:

Bureau of Entomology and Plant Quarantine	U. S. Forest Service
F. J. Heinrich, Operation Supervisor	B. C. Amsbaugh, Forest Officer
H. J. Faulkner, Assistant Operation Supervisor	Ray Van Dusen, Unit Supervisor
John C. Gonyou, Checker Foreman	
Charles W. Long, Unit Supervisor	
George A. Meyer, Unit Supervisor	

Program	Number Camps	Number Workers	Number Checkers
E.Q.-Cooperative	7	295	4
F.S.-Regular	5	185	3

Total workers employed on blister rust control 480.

First camp was established on May 20 and the last camp occupied June 23. All student camps were closed by September 15 while the Mexican crews worked until September 20.

LOCATION AND DESCRIPTION OF AREAS

Cooperative Camps on State and Private Land

Camp 110, Powder House, located T. 37 N., R. 5 E., sec. 27. This camp was located near the Powder House on a tributary of Quartz Creek. First working was

performed on an area logged in 1938-1939, located below the mouth of Quartz Creek. Ribes were comparatively light on the south and west slopes but numerous on the north-facing slopes. Second and third working was performed on adjacent areas which were cut in 1928 and 1930. Additional workings will be needed on the recent cutover area and spot working on the earlier cutover areas.

Camp 111, Rhodes Creek, located T. 36 N., R. 5 E., sec. 1. The work area lay along both sides of Rhodes Creek, extending down stream approximately two and one half miles from the national forest boundary. White pine mature was removed during the years 1940-1944. A five-chain belt of 60-year-old white pine pole remains along the main Rhodes Creek drainage. Ribes removed were 300 per acre from the cutover area. Future well-timed workings will be necessary in order to prevent serious damage to the pole stands and to the reproduction that is becoming established on the logged area.

Camp 112, Campbell's Pond, located T. 37 N., R. 5 E., sec. 18. This camp was located at Campbell's Pond on Poorman Creek. Ribes removed from sections 18 and 19 ran approximately 15 per acre. This was all second working on land cut over from 1930-1935. This area should carry through with a little future work along the streams. Working conditions were more difficult in sections 24 and 25 due to brush density and windfalls. An average of 400 ribes per acre was removed from these areas and additional future work will be necessary to afford protection. A fast spot working was given 175 acres in section 17 which is known as the Hollywood area.

Camp 113, Deer Creek, located T. 38 N., R. 5 E., sec. 13. When this area was cut over in 1935, a good white pine seed source was left. The area has been grazed each season by sheep. This resulted in a low, dense cover of brush. The area supports numerous small dwarf ribes which are difficult to eradicate. This dwarf bush problem is characteristic of many cutover areas on the Clearwater. Additional future work will be needed on part of the area before protection is established.

Camp 114, Bush Creek, located T. 39 N., R. 6 E., sec. 33. The work area lies in the upper end of the Schofield burn and was an extension of work done in 1944 and 1945. One more season's work remains to complete the second working on this area. Ribes removed averaged 225 per acre. Working conditions were difficult due to the density of brush and reproduction. Ribes petiolare was present on all stream type and was destroyed with chemical. Schofield area carries heavy blister rust infection and additional work will be necessary before the young pine is given protection.

Camp 115, Otter Creek, located T. 39 N., R. 6 E., sec. 35. Personnel from this camp worked in the lower part of the Schofield burn which is a portion of the same block as worked by Camp 114. The same working conditions prevailed. There remains one more season's work on Rettig Creek to complete second working on this area.

Camp 116, Reeds Creek, located T. 38 N., R. 5 E., sec. 26. This camp area lies between C.T.P.A. and the Summit Lookout. First working was performed on 334 acres of 1941 cutover land. The area supported numerous large R. viscosissimum

averaging 900 per acre. Second working was done on 132 acres, removing 45 ribes per acre. An average of two man-days per acre was expended on both first and second workings. It is contemplated to use chemicals applied by power sprayers on the remaining unworked upland area which supports large R. viscosissimum, averaging over a thousand per acre. Another season's work remains from this campsite.

Forest Service Camps on Federal Lands

Camp 171, Preacher Gulch, located T. 36 N., R. 6 E., sec. 6. Most of the ribes eradication work was first working on lands cut over from 1940-1945. A portion of the area lying in T. 37 N., R. 6 E., was rework on lands cut over during the period 1920-1929. The area as a whole still supports an adequate stocking of white pine reproduction and pole. With the exception of stream bottoms, which supported a heavy population of ribes, little future work will be required to afford protection from blister rust.

Camp 172, Orogrande Creek, located T. 37 N., R. 7 E., sec. 23. Ribes were removed from the upland and stream types on Tama and lower Tamarack Creek drainages. Working conditions in the reproduction areas were difficult due to the density of reproduction and brush. It is believed that this area is protected although future periodic inspections will be needed.

Camp 173, Sylvan Creek, located T. 37 N., R. 7 E., sec. 3. Work was performed on plantations established in 1939 and 1940 and on areas of natural white pine reproduction and pole in Sylvan Creek. Protection has been established on the areas supporting pole and reproduction. The plantation is now in satisfactory condition; however, periodic inspections will be needed during the next few years to locate any areas requiring additional work.

Camp 174, Three Bear, located T. 37 N., R. 7 E., sec. 33. Work area lies in Tamarack Creek drainage. A small area in the upper portion is white pine reproduction. Windfalls and brush density made difficult working conditions. The remainder of the area is pole type and ribes were generally light. Only those portions of the area supporting numerous ribes were worked intensively, the balance being worked by the flanking method. The area is now in satisfactory condition and very little additional work will be needed prior to harvesting.

Camp 175, Moose Creek, located T. 40 N., R. 11 E., sec. 31. Approximately half of the 653 acres of the pole type was given second working and the remainder initial. Ribes were generally light with 33 ribes per acre eradicated from the initial work area and 13 ribes per acre from the area given second working. Ribes appeared mainly within the stream zone and a belt along the ridge tops. Intensive working was given only part of the area, and the flanker method used on the remainder. One more working will be necessary to establish protection.

METHODS AND EQUIPMENT

Standard eradication methods were used throughout the season. The type of method used was dependent on type of area to be worked and quality of men available. Ammate and 2,4-D were used for the first time as ribicides on stream type ribes.

Pine Disease Survey

Pine disease survey was run where definite disease information was needed. A systematic survey method was used, running strips every five chains. Disease information was obtained by examining five trees at the end of each chain with the exception of the Hollywood area where ten trees were examined. Data on year of origin were recorded back to 1936. Trees were classed as fatally infected if they had a trunk canker or a limb canker within eight to twelve inches from the trunk, depending upon the size of limb. If a healthy tree occurred within eight feet of an infected one, no damage to stocking was figured. Ribes data were also taken along the entire strip. On some areas overwood was recorded every ten chains.

Results of the 1946 pine disease survey are shown in the following table:

PINE DISEASE SURVEY SUMMARY, 1946

Name	T	R	S	No. Trees Examined	Trees Infected		Trees with Killing Cankers		Stocking Trees Fatally Infected	Ht. of Trees
					No.	Per cent	Number	Per cent		
Hollywood	37N	5E	17	7,312	1,230	17	1,183	16	83	3-12'
Hollywood	37N	5E	9	648	150	23	140	22	14	3-12'
Schofield	39N	6E	35 33,34	985	646	65	526	53	379	1-20'
Flat Creek	36N	5E	9	2,038	215	10	206	10	25	1- 4'
Three Mile	37N	5E	34	870	269	31	204	23	42	3-11'
Jaype	37N	5E	21,28 14	1,071	194	18	121	11	4	3-12'
Orofino Cr.Lkt.	36N	4E	11,13	223	43	19	28	13	9	15-30'
Grasshopper Cr.	36N	5E	21,28	930	110	12	107	12	6	1- 6'
Camp "C"	38N 37	4E 5	2,3,10 29,31,6	316	212	67	196	62	94	3-15'
Reeds Cr.	38N	6E	35,36 30,32	213	112	53	110	51	41	1- 3'
Mussellshell	36N	6E	22	577	237	41	195	34	53	3-12'

Schofield and Camp "C" areas are the most heavily infected of any work areas on the operation. Considerable damage has already occurred as the original stocking on these two areas was medium to poor. Loss to stocking can definitely be attributed to lack of follow-up work due to an inadequate work program. In the Schofield area, first working was done in 1934, 1935 and 1936. Second working did not get underway until 1944 which was at least seven years too late. A similar situation occurred in the Camp "C" area. Unless rework is performed on schedule, damage must be expected on work areas.

The Hollywood area in T. 37 N., R. 5 E., sec. 17, shows the results of the proper application of blister rust control measures. This area was logged in 1934-1935. The area now supports an excellent stand of reproduction which has successfully withstood the 1937 and 1941 infection waves. Although some additional work will be necessary, no particular difficulty is anticipated in establishing permanent control. Other than the Camp "C" area which was logged in 1929-1930, no cutover work area has been seriously damaged by blister rust.

Control Status

The general status of control work on the Clearwater National Forest remains favorable. A yearly control program of approximately 300 capable workers for the next five years should place the majority of pole and reproduction areas on a maintenance basis. This program would also take care of present cutover areas.

On the Clearwater Timber Protective Association, a more difficult control problem exists. This is a result of the large acreage that is being converted from protected mature to cutover areas which will require from two to three workings. Cutover areas, as a whole, are being left in a satisfactory condition for the re-establishment of a white pine stand.

The future success of control work will be dependent upon an adequate yearly program. The size will depend materially upon the acreage of mature timber that will be cut in the future. It appears that 500 workers yearly for the next five years can bring the control program up to date on Association lands.

Checking

The checking organization consisted of three Forest Service and four Bureau checkers. Three of the group were veterans, one having previous checking experience. The others were teen-age workers who had at least two seasons' ribes eradication experience. The veterans worked out best because of their broader experience and maturity. All worked under the direct supervision of the checker foreman.

All areas were given a regular check with the exception of some pole areas that were worked late in the season by the checker flanker method. A check on these areas this coming season will be of much more value than any check that could have been run the current season.

In addition to the regular checking, 5,814 acres were covered in an advance check and 5,454 acres by post check. Most of the advance check was done on unworked cutover (1940-1945) while the post check was performed on cutover (1920-1939) areas.

The results of the final check showed that approximately 90 per cent of the current season's eradication work was acceptable under the recognized standards of efficiency.

1947 CHECKING RESULTS

Camp No.	Chains Run	Bushes	Feet Live Stem	Per Acre Basis No. Bushes	Per Acre Basis F.L.S.
Bureau of Entomology and Plant Quarantine					
110	427	113	170	13	20
111	1,285	511	541	20	21
112	2,820	102	229	2	4
113	2,190	303	815	7	18
114	764	54	199	4	13
115	861	81	387	5	22
116	614	227	690	18	57
All	8,961	1,391	3,031	8	17
Forest Service					
171	1,935	202	349	5	9
172	858	91	388	5	23
173	1,014	42	121	2	6
All	3,807	335	858	4	11

Advance check 5,814 acres
Post check 5,454 acres

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures and costs is shown in the following tables by the cooperative agency and the type of appropriation.

TABLE 1

EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
CLEARWATER OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 14,721.74
	Regular BLR-3-4	131,747.08
	Subtotal	$146,468.82
State of Idaho	State BLR-3-4	$ 2,996.88
Clearwater Timber Protective Association	Private BLR-3-4	10,741.97
	Subtotal	$ 13,738.85
Forest Service	Regular BLR-4	$109,209.74
Total		$269,417.41

TABLE 2

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
CLEARWATER OPERATION

Item	Bureau of Entomology and Plant Quarantine				Forest Service	Total
	Regular BLR-1-4	Regular BLR-3-4	State and Private BLR-3-4	Total	Regular BLR-4	
Sal. perm. men	$11,693.05	$ 980.33		$ 12,673.38	$ 5,639.96	$ 18,313.34
Sal. temp. men	402.23	27,694.83	$ 1,730.69	29,827.75	15,209.90	45,037.65
Wages, temp. labs.	763.80	62,090.09	11,666.97	74,520.86	64,842.22	139,363.08
Subs. supplies		23,649.08	341.19	23,990.27	14,776.86	38,767.13
Equipment		4,985.76		4,985.76	3,352.35	8,338.11
Trucks		2,850.37		2,850.37		2,850.37
Travel & transp.	583.32	2,124.42		2,707.74	2,409.15	5,116.89
Other Supplies	1,279.34	7,372.20		8,651.54	2,979.30	11,630.84
Total	$14,721.74	$131,747.08	$13,738.85	$160,207.67	$109,209.74	$269,417.41

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
CLEARWATER OPERATION

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
First	Cutover	1940-44	2,354	2,724	759,217	1.16	323
	Cutover	1920-39	449	1,177	77,469	2.62	173
	Pole		329	352	10,901	1.07	33
	Total		3,132	4,253	847,587	1.36	271
Second	Cutover	1940-44	80	74	4,208	.93	53
	Cutover	1920-39	1,326	1,245	44,966	.94	34
	Reproduction	1910-39	1,070	2,412	131,280	2.25	123
	Pole		1,226	195	5,911	.16	5
	Mature		266	182	3,833	.68	14
	Total		3,968	4,108	190,198	1.04	48
Third	Cutover	1920-39	1,495	1,343	149,631	.90	100
	Reproduction	1910-39	735	1,642	65,070	2.23	89
	Pole		1,177	755	13,909	.64	12
	Stream (3)		68	101	6,641	1.49	98
	Total		3,475	3,841	235,251	1.11	68
All Workings	Cutover	1940-44	2,434	2,798	763,425	1.15	314
	Cutover	1920-39	3,270	3,765	272,066	1.15	83
	Reproduction	1910-39	1,805	4,054	196,350	2.25	109
	Pole		2,732	1,302	30,721	.48	11
	Mature		266	182	3,833	.68	14
	Stream (4)		68	101	6,641	1.49	98
	Total		10,575	12,202	1,273,036	1.15	120

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)			114
(3)	68	101	1,132
(4)	68	101	1,246

TABLE 4

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1946
CLEARWATER OPERATION

State	Working	Class	Acres	Man-Days	Ribes	Gallons Spray	Per Acre Man-Days	Per Acre Ribes
Idaho	First	EQ-Coop.	1,813	2,951	704,653	21	1.63	389
		FS-Reg.	1,319	1,302	142,934	93	.99	108
		Total	3,132	4,253	847,587	114	1.36	271
	Second	EQ-Coop.	2,223	3,219	175,768		1.45	79
		FS-Reg.	1,745	889	14,430		.51	8
		Total	3,968	4,108	190,198		1.04	48
	Third	EQ-Coop.	1,563	1,444	156,272	1,132	.92	100
		FS-Reg.	1,912	2,397	78,979		1.25	41
		Total	3,475	3,841	235,251	1,132	1.11	68
	All Workings	EQ-Coop	5,599	7,614	1,036,693	1,153	1.36	185
		FS-Reg.	4,976	4,588	236,343	93	.92	47
		Total	10,575	12,202	1,273,036	1,246	1.15	120

TABLE 5

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
CLEARWATER OPERATION

State	Working	Acres Worked: By Forest Service: National Forest	By Forest Service: Private	By Forest Service: Total	By Bureau of Entomology and Plant Quarantine: National Forest	By Bureau of Entomology and Plant Quarantine: State	By Bureau of Entomology and Plant Quarantine: Private	By Bureau of Entomology and Plant Quarantine: Total	Total: Federal: National Forest	Total: Other: State	Total: Other: Private	Total: Other: Total	Total: Total
Idaho	First	1,131	188	1,319		464	1,349	1,813	1,131	464	1,537	2,001	3,132
	Second	1,745		1,745	80	327	1,816	2,223	1,825	327	1,816	2,143	3,968
	Third	1,912		1,912	83	148	1,332	1,563	1,995	148	1,332	1,480	3,475
	Total	4,788	188	4,976	163	939	4,497	5,599	4,951	939	4,685	5,624	10,575

TABLE 6

RIBES SPECIES ERADICATED, 1946
CLEARWATER OPERATION

Working	Eradication Type	Acres	Ribes Species: Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes triste	Total Ribes
First	Cutover (1940-44)	2,354	85,673	669,328	4,216		759,217
	Cutover (1920-39)	449	18,829	56,700	1,940		77,469
	Pole	329	8,598	2	2,301		10,901
	All Types	3,132	113,100	726,030	8,457		847,587
Second	Cutover (1940-44)	80	2,107	1,520	581		4,208
	Cutover (1920-39)	1,326	9,015	35,271	680		44,966
	Reproduction (1910-39)	1,070	129,234	1,320	691	35	131,280
	Pole	1,226	4,955	327	629		5,911
	Mature	266	2,420	1,403	10		3,833
	All Types	3,968	147,731	39,841	2,591	35	190,198
Third	Cutover (1920-39)	1,495	6,791	140,854	1,986		149,631
	Reproduction (1910-39)	735	45,208	18,214	1,648		65,070
	Pole	1,177	4,431	9,478			13,909
	Stream	68	1,854	1,138	3,649		6,641
	All Types	3,475	58,284	169,684	7,283		235,251
All Workings	Cutover (1940-44)	2,434	87,780	670,848	4,797		763,425
	Cutover (1920-39)	3,270	34,635	232,825	4,606		272,066
	Reproduction (1910-39)	1,805	174,442	19,534	2,339	35	196,350
	Pole	2,732	17,984	9,807	2,930		30,721
	Mature	266	2,420	1,403	10		3,833
	Stream	68	1,854	1,138	3,649		6,641
	All Types	10,575	319,115	935,555	18,331	35	1,273,036

TABLE 7

SUMMARY OF RIBES ERADICATION, 1929-1946
CLEARWATER OPERATION

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre		Net Acreage Remaining	
						Man-Days	Ribes	Worked	Unworked
First	Cutover	1945-49							1,840
	Cutover	1940-44	5,341	8,773	4,450,070	1.64	833	5,341	29,868
	Plantation	1940-44	60	232	134,749	3.87	2,246	60	
	Cutover	1920-39	37,708	38,899	13,566,785	1.03	360	35,885	31,496
	Reproduction	1910-39	71,329	108,331	33,428,751	1.52	469	70,613	4,248
	Pole		30,254	17,489	3,839,237	.58	127	28,945	6,002
	Mature		219,289	99,830	23,422,354	.46	107	166,711	39,728
	Miscellaneous		5,852	3,900	1,700,804	.67	291	5,416	7,819
	Stream (1)		42,353	78,124	14,058,124	1.84	332	42,353	13,675
	Total		412,186	355,628	94,600,924	.86	230	353,324	134,676
Second	Cutover	1940-44	80	74	4,208	.93	53	80	
	Plantation	1940-44	60	194	15,537	3.23	260	60	
	Cutover	1920-39	30,258	29,414	8,219,075	.97	272	30,258	
	Reproduction	1910-39	24,532	38,423	3,649,880	1.57	149	24,456	
	Pole		15,221	8,087	1,116,703	.53	73	14,582	
	Mature		16,333	7,983	815,665	.49	50	14,173	
	Miscellaneous		511	573	371,107	1.12	726	511	
	Stream (2)		23,780	26,966	3,329,143	1.13	140	23,780	
	Total		110,775	111,714	17,521,368	1.01	158	107,900	
Third	Cutover	1920-39	12,327	13,711	1,071,727	1.11	87	12,327	
	Reproduction	1910-39	6,381	9,340	444,286	1.46	70	6,381	
	Pole		1,177	755	13,909	.64	12	1,177	
	Stream (3)		3,328	3,773	335,748	1.13	101	3,328	
	Total		23,213	27,579	1,865,670	1.19	80	23,213	
All Workings	Cutover	1940-44	5,421	8,847	4,454,278	1.63	822	5,421	
	Plantation	1940-44	120	426	150,336	3.55	1,253	120	
	Cutover	1920-39	80,293	82,024	22,857,587	1.02	285	76,470	
	Reproduction	1910-39	102,242	156,094	37,522,917	1.53	367	101,450	
	Pole		46,652	26,331	4,969,899	.56	107	44,704	
	Mature		235,622	107,863	24,238,019	.46	103	180,884	
	Miscellaneous		6,363	4,473	2,071,911	.70	326	5,927	
	Stream (4)		69,461	108,363	17,723,015	1.57	255	69,461	
	Total		546,174	494,921	113,987,962	.91	209	484,437	

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	15,027	31,191	794,598
(2)	5,875	8,142	119,985
(3)	818	1,296	19,795
(4)	21,720	40,629	934,378

TABLE 8

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1929-1946
CLEARWATER OPERATION

State	Class	Gross Acres	Man-Days	Total Ribes	Gallons Spray	Per Acre	
						Man-Days	Ribes
Idaho	EQ-Reg.	4,412	5,273	1,129,228	79,864	1.20	256
	EQ-Coop.	49,365	46,158	6,793,408	140,075	.94	138
	EQ-Emerg.	133,970	125,277	30,398,093	136,847	.94	227
	FS-Reg.	115,037	106,963	28,530,568	144,980	.93	248
	FS-Emerg.	55,908	45,382	14,895,022	24,015	.81	266
	CCC	187,482	165,868	32,241,643	408,597	.88	172
	Total	546,174	494,921	113,987,962	934,378	.91	209

TABLE 9

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1929-1946
CLEARWATER OPERATION

State	Ownership	Net Acres in Control Area					
		Acres Worked				Acres Unworked	Total Acres
		First	Second	Third	Total		
Idaho	National Forest	151,457	51,540	8,768	211,765	48,895	200,352
	Public Domain	3,680	708	12	4,400	350	4,030
	Subtotal Federal	155,137	52,248	8,780	216,165	49,245	204,382
	State	61,258	13,900	1,470	76,628	29,000	90,258
	Private	136,929	41,752	12,963	191,644	56,431	193,360
	Subtotal Other	198,187	55,652	14,433	268,272	85,431	283,618
	Total	353,324	107,900	23,213	484,437	134,676	488,000

BLISTER RUST CONTROL WORK, ST. JOE OPERATION, 1946

By

H. J. Hartman, Operation Supervisor
D. J. Moore, Forester, U. S. Forest Service
W. F. Painter, Assistant Operation Supervisor
M. D. Oaks, Forester, U. S. Forest Service
Robert H. Kliewer, Unit Supervisor

INTRODUCTION

Blister rust control work was continued on the St. Joe operation for the eighteenth consecutive year. The operation comprises 884,925 acres of western white pine type in the St. Joe National Forest and Potlatch Timber Protective Association. Of the total area 29 per cent is cutover, 31 per cent reproduction, 16 per cent pole, 23 per cent mature, and 1 per cent miscellaneous types.

At the close of the 1946 field season 481,998 acres had been worked initially, 147,297 acres worked the second time, and 44,516 acres three or more times. About 49 per cent of the control area is on a maintenance basis or in a sufficiently satisfactory status to be brought through to maturity under the present program. The remaining 51 per cent of the control area is not being adequately protected with the present rate of progress. On this area nearly a complete loss will be sustained unless the control program is greatly increased. White pine reproduction and young pole have already been lost on 11 per cent of the control area.

ORGANIZATION AND ADMINISTRATION

Control activities on the St. Joe operation were organized in accordance with agreements between federal, state, and private agencies. Personnel of the Bureau of Entomology and Plant Quarantine provided assistance in the over-all planning, coordination, and technical direction of the program on lands of all ownerships. The Bureau also administered the cooperative control program, consisting of seven camps. Four of the cooperative camps were located within the Association boundaries and worked on state and private lands in the Oviat, Cameron, and West Fork of Potlatch drainages. Three Bureau camps, financed entirely with federal funds for work on lands of intermingled ownership, were located in the St. Maries River drainage near Clarkia, Idaho. The Forest Service financed and administered the work of eight camps on National Forest lands. The work season averaged slightly over two months per camp. The labor was mostly high school students and Mexican Nationals.

A checking supervisor from the Bureau was in charge of all checking, and also assisted in the technical supervision of all camps.

Ribes eradication work in all Forest Service camps was interrupted by forest-fire calls throughout the month of August. Such interruptions result in labor turnover and greatly increased blister rust control costs.

The blister rust control 1946 field organization was as follows:

Bureau of Entomology and Plant Quarantine	U. S. Forest Service
H. J. Hartman, Operation Supervisor	D. J. Moore, Forest Officer
W. F. Painter, Assistant Operation Supervisor	M. D. Oaks, Forest Officer
R. H. Kliewer, Unit Supervisor	K. G. Reinhart, Forest Officer
	Clyde Miller, Checker Foreman
	F. A. Moore, Unit Supervisor
	H. W. Seaman, Unit Supervisor
	C. A. Schwartz, Unit Supervisor

Program	Number Camps	Number Workers	Number Checkers
E.Q. - Cooperative	7	320	4
F.S. - Regular	8	*400	6

Total number employed on blister rust control - 720

*120 were Mexican Nationals.

Field headquarters at Clarkia, Idaho, maintained by the Bureau, was used as an operating base for all Bureau and some Forest Service activities. The warehousing and supplying of subsistence for Forest Service camps were handled through the Clarkia Ranger Station Warehouse.

Mexican Nationals were secured through the War Food Administration for blister rust control work in the Forest Service camps. One hundred twenty reported in early July and were transferred to the sugar beet fields in mid-September. Observations during the past three seasons have shown that Mexican Nationals are not particularly adaptable to ribes eradication work, especially on areas of light ribes concentrations. Accomplishments and quality of work are not comparable to that of regular crews. Work areas for Mexican Nationals were specially selected in order to obtain maximum accomplishments from that class of labor.

LOCATION AND DESCRIPTION OF AREAS

Drainage	T	R	S	Date Established	Date Closed	Class of Labor	Size
BUREAU - COOPERATIVE CAMPS							
Cameron Creek	40N	2E	32	May 20	Sept. 13	Students	66
Oviat Creek	39N	1E	2	May 28	Aug. 19	Students	45
Purdue Creek	41N	1E	18	June 3	July 31	Students	45
W. F. Potlatch Creek	41N	1W	23	June 10	Aug. 23	Students	45
Hidden Creek	42N	1E	27	May 22	Aug. 23	Students	66
Merry Creek	43N	2E	29	June 10	Aug. 14	Students	45
Graves Creek	42N	2E	26	June 10	Aug. 21	Students	45
FOREST SERVICE CAMPS							
Willow Creek	43N	2W	6	June 6	Aug. 26	Students	66
Charlie Creek	43N	2W	15	June 21	Aug. 11	Students	66
Charlie Creek	43N	2W	27	July 10	Sept. 25	Mexicans	33
Bechtel Creek	42N	1E	12	June 4	Aug. 28	Students	66
Feather Creek	41N	1W	1	June 12	Aug. 29	Students	66
Cats Spur Creek	42N	2E	19	June 18	July 31	Students	33
Norton Creek	44N	2E	35	July 7	Sept. 22	Mexicans	66
Toles Creek	44N	2E	26	July 10	Sept. 22	Mexicans	33

While blister rust infection on the St. Joe is very critical, there has been no appreciable amount of new pine infection since the very heavy wave in 1941. All control efforts were directed toward the protection of well-stocked reproduction and pole stands of western white pine on sites I and II. With one exception, all camps were engaged in second and third workings. The Merry, Norton, and Toles Creek camps spent nearly the entire season on third and fourth workings of stream type. The Willow and lower Charlie Creek camps worked in young plantations, while the upper Charlie Creek camp was engaged in first working of a very heavy ribes belt at the head of the drainage to expand the protection zone for the Charlie Creek plantation.

METHODS AND EQUIPMENT

In May a four-day training school was held for blister rust control supervisory personnel. A complete review of ribes eradication, first aid, and safety measures was presented. Straw bosses and crew men were given thorough training on the job. The present-day, inexperienced worker requires from eight to twelve days of training before he can do effective ribes eradication work. In the Bureau camps 28 per cent of all laborers employed quit during the training period. Personnel training and management consume about two-thirds of the time of the camp boss.

Using the flanker method, one four-man Bureau crew worked 956 acres of open and dense pole with an expenditure of 81 man-days. The four-man crew worked a strip two to three chains in width. The outside man ran the compass and laid the string line, which served as a guide line on the return strip.

Ammonium sulfamate was used on all stream-type areas supporting medium to heavy ribes, regardless of species, and was applied on Lines, Toles, Norton, Merry,

and Lower Charlie Creek as well as the East and West Fork of the St. Maries River. Ammonium sulfamate replaced Atlacide for all chemical ribes eradication in 1946, as it has the advantage of being effective on all species of ribes. Through the use of this chemical, the entire stream-type ribes eradication job is completed in one operation.

CHECKING

The lack of competent personnel available as trainees for checkers did not permit any appreciable increase of the 1946 checking organization. Three checkers from the 1945 season were available by mid-June. Seven additional students were trained during the field season. A checker foreman assisted in the training and supervision of the checkers.

The method of checking areas by working two checkers together along a check strip was continued, and the system seems very satisfactory, especially with the quality of labor available.

A total of 11,706 acres of area worked in 1946 was checked; 6,680 acres were post checked within and adjacent to 1946 camp areas. No check was made of any areas worked by Mexican labor, since one camp was engaged on first working with very heavy ribes, and the other two camps of Mexicans worked stream type.

SURVEYS

Pine Stocking Survey. An eight-man survey crew, financed from regular Forest Service funds, inspected 12,560 acres on the St. Joe Forest to secure needed information on the amount, distribution of white pine and associate species, site quality, and working conditions. A running count of the white pine along a 13.2-foot strip was tallied; and, in addition, the presence of white pine and associate species was tallied on a four-milacre quadrat at the end of every chain. Parallel strips were run at 10-chain intervals. The data supplemented prior random inspections of the areas and provided sufficient information to properly appraise the areas for future blister rust control work. The survey was conducted subsequent to the close of the ribes eradication season.

Disease Survey. A checker foreman, assisted by two checkers, inspected a number of areas on which disease survey data were needed. The inspections on the Middle Fork of Big Creek and Mowat Creek drainages were made by the permanent personnel.

The data for the various inspections are shown in the following summaries:

Hatton Creek, T. 43 N., R. 1 E., secs. 3, 4, and 9

Chains survey strip	367
Number trees examined	3,664
Number trees infected	153
Per cent of trees infected	4
Total number cankers	157
Per cent of infected trees with trunk cankers	5

Area planted spring 1940, first work 1940. Very heavy ribes. Area reworked in 1941. Disease survey 1943, 2 per cent infection. Third work on half the area by Mexican labor in 1945. Of 157 cankers examined in 1946, 34 on 1943 wood in pycnial stage. Remaining cankers were on 1941 and 1942 wood and had fruited at least once. No damage to present stocking. Additional rework will be necessary to place area in satisfactory status.

Mica Creek Area, T. 44 N., R. 2 E., secs. 5, 7, 8, and 17

Chains survey strip	297
Number trees examined	3,718
Number trees infected	2,215
Per cent of trees infected	59
Per cent of infected trees with trunk cankers	74

Reproduction 0-20, first work 1936-39-40. Portion of area worked in 1936 reworked in 1939. Total area on rework basis. Disease survey in 1943 on contiguous area showed 45 per cent infection. Seventy-five per cent of cankers on 1943 survey of 1937 origin or earlier. Damage to present stocking very heavy. Present values on the area and its present status do not warrant consideration in present program.

Charlie Creek Area, T. 43 N., R. 2 W., secs. 10, 15, 16, 21, and 22

Chains survey strip	396
Number trees examined	3,246
Number trees infected	153
Per cent of trees infected	5
Per cent of infected trees with trunk cankers	51

There are 1,368 acres of plantation in this area. Plantings made in fall of 1940 and spring of 1941. Scattered natural reproduction on the area 0-20. First work performed in 1941-1942, second work in 1946. Disease survey, 1941, 1.5 per cent infection. No new infection observed since heavy wave of 1941. All cankers observed in 1946 of 1937 and 1941 origin. Additional work will be necessary on the area to prevent future damage.

Willow Creek Area, T. 43 N., R. 3 W., secs. 12 and 13

Chains survey strip	158
Number trees examined	2,090
Number trees infected	118
Per cent of trees infected	6
Per cent of infected trees with trunk cankers	59

Plantation area. Plantings made in 1937-38-39-40. First work by CCC's in 1939. Reworked in 1941 by CCC's. Reworked in 1943 and 1946. No disease survey prior to 1946. Present cankers result of 1941 infection. Four cankers found on 1943 wood and 4 on 1944 wood. One more working should place area in satisfactory status.

Middle Fork Big Creek, T. 47 N., R. 3 E., secs. 27 and 34

Chains survey strip	31
Number trees examined	639
Number trees infected	526
Per cent of trees infected	82
Per cent of infected trees with trunk cankers	67

Plantation area. First planting in spring 1925, successive plantings in 1926-27-33. Very steep country. Plantations surrounded by heavy ribes. First work on area in 1932. Second work in 1939. Disease survey in 1939 indicated 5 per cent infection. Of cankers examined in 1946, 95 per cent result of 1941 infection. Remainder prior to 1941. No new infection since 1941. Damage to present stocking very heavy. Area in a rework status.

Mowat Creek Area, T. 46 N., R. 3 E., sec. 22

Chains survey strip	15
Number trees examined	167
Number trees infected	113
Per cent of trees infected	68
Per cent of infected trees with trunk cankers	85

Plantation area. Planted in spring of 1932. Area located in very steep and brushy country, completely surrounded by heavy ribes concentrations. First work in 1932-39. Second work in 1939. The first work in 1939 extended work area of 1932 to provide a wider protection zone. Disease survey in 1939 indicated 5 per cent infection over area. Of cankers examined in 1946, 95 per cent of 1941 origin. Plantation area relatively free of ribes, but heavy ribes concentrations exist beyond established protective zones.

Marble Creek and Tributaries, T. 44 N., R. 2 E., sec. 23, 24, 26, 27, 35
T. 44 N., R. 3 E., secs. 20 and 29

Chains survey strip	940
Number trees examined	8,789
Number trees infected	4,463
Per cent of trees infected	51
Per cent of infected trees with trunk cankers	34

Reproduction 0-20. Area, prior to initial eradication, possessed very heavy upland and stream type ribes. First work by regular crews in 1934. Second work in 1938 by W.P.A. confined to stream type. Second work on upland in 1939. Third work on very small portion of area in main Marble in 1941. Third work in 1944 on areas on Cranberry, Bussell, and Toles. In 1945, area not worked in 1944 worked by Mexican labor. In 1946 Mexican labor again used to rework the stream type and small portions of upland area not completed in 1945.

Infection was found on ribes in Marble Creek in 1926. By 1934 the rust was well established in the area due to very heavy concentrations of <u>Ribes petiolare</u> in the stream type. An extensive survey in 1938 indicated 30 per cent of the trees were infected. A survey in 1943 indicated 50 per cent of the trees were infected. A systematic survey in 1946 showed an average of 51 per cent of the trees infected.

A breakdown of the infection on the tributaries of Marble is shown below:

<u>Lines Creek Area</u>

Chains survey strip	25
Number trees examined	256
Number trees infected	145
Per cent of trees infected	57
Per cent of infected trees with trunk cankers	68

<u>Norton Creek Area</u>

Chains survey strip	55
Number trees examined	365
Number trees infected	255
Per cent of trees infected	70
Per cent of infected trees with trunk cankers	87

<u>Toles Creek Area</u>

Chains survey strip	86
Number trees examined	733
Number trees infected	524
Per cent of trees infected	71
Per cent of infected trees with trunk cankers	83

<u>Bear Creek Area</u>

Chains survey strip	188
Number trees examined	1,786
Number trees infected	771
Per cent of trees infected	43
Per cent of infected trees with trunk cankers	63

<u>Bussell Creek Area</u>

Chains survey strip	422
Number trees examined	4,016
Number trees infected	2,121
Per cent of trees infected	53
Per cent of infected trees with trunk cankers	71

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures is shown in the following tables by the cooperative agency and the type of appropriation:

TABLE 1

EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
ST. JOE OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 18,809.34
	Regular BLR-3-4	147,202.88
	Subtotal	$166,012.22
State of Idaho	State BLR-3-4	$ 4,682.00
Potlatch Timber Protective Association	Private BLR-3-4	8,944.30
	Subtotal	$ 13,626.30
Forest Service	Regular BLR-4	$223,578,59
Total		$403,217.11

TABLE 2

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
ST. JOE OPERATION

Item	Bureau of Entomology and Plant Quarantine				Forest Service	Total
	Regular BLR-1-4	Regular BLR-3-4	State and Private BLR-3-4	Total	Regular BLR-4	
Sal. perm. men	$15,822.36	$ 4,627.84		$ 20,450.20	$ 15,580.52	$ 36,030.72
Sal. temp. men	82.78	23,398.36	$ 945.25	24,426.39	25,414.37	49,840.76
Wages, temp. labs.	76.43	77,251.78	12,522.16	89,850.37	116,765.55	206,615.92
Subs. supplies		24,244.05	158.89	24,402.94	39,058.39	63,461.33
Equipment		4,961.76		4,961.76	17,715.98	22,677.74
Trucks		2,850.37		2,850.37		2,850.37
Travel & transp.	716.78	2,287.63		3,004.41	5,500.86	8,505.27
Other supplies	2,110.99	7,581.09		9,692.08	3,542.92	13,235.00
Total	$18,809.34	$147,202.88	$13,626.30	$179,638.52	$223,578.59	$403,217.11

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
ST. JOE OPERATION

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
First	Reproduction	1910-39	300	1,174	410,320	3.91	1,368
First	Stream (1)		21	102	14,869	4.86	708
First	Total		321	1,276	425,189	3.98	1,325
Second	Plantation	1940-44	398	425	2,805	1.07	7
Second	Cutover	1920-39	56	120	7,250	2.14	129
Second	Reproduction	1910-39	2,411	3,525	72,534	1.46	30
Second	Pole		241	13	271	.05	1
Second	Stream (2)		16	71	2,834	4.44	177
Second	Total		3,122	4,154	85,694	1.33	27
Third	Cutover	1920-39	1,555	1,803	53,438	1.16	34
Third	Reproduction	1910-39	5,690	9,217	122,766	1.62	22
Third	Pole		1,055	397	4,233	.38	4
Third	Stream (3)		1,756	2,686	96,313	1.53	55
Third	Total		10,056	14,103	276,750	1.40	28
All Workings	Plantation	1940-44	398	425	2,805	1.07	7
All Workings	Cutover	1920-39	1,611	1,923	60,688	1.19	38
All Workings	Reproduction	1910-39	8,401	13,916	605,620	1.66	72
All Workings	Pole		1,296	410	4,504	.32	3
All Workings	Stream (4)		1,793	2,859	114,016	1.59	64
All Workings	Total		13,499	19,533	787,633	1.45	58

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	16	50	662
(2)	16	30	246
(3)	1,458	2,102	7,815
(4)	1,490	2,182	8,723

TABLE 4

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1946
ST. JOE OPERATION

State	Working	Class	Acres	Man-Days	Ribes	Gallons Spray	Per Acre Man-Days	Per Acre Ribes
Idaho	First	EQ-Coop.	59	162	76,320		2.75	1,294
Idaho	First	FS-Reg.	262	1,114	348,869	662	4.25	1,332
Idaho	First	Total	321	1,276	425,189	662	3.98	1,325
Idaho	Second	EQ-Coop.	1,968	2,170	45,778	246	1.10	23
Idaho	Second	FS-Reg.	1,154	1,984	39,916		1.72	35
Idaho	Second	Total	3,122	4,154	85,694	246	1.33	27
Idaho	Third	EQ-Coop.	6,123	6,615	129,593	4,584	1.08	21
Idaho	Third	FS-Reg.	3,933	7,488	147,157	3,231	1.90	37
Idaho	Third	Total	10,056	14,103	276,750	7,815	1.40	28
Idaho	All Workings	EQ-Coop.	8,150	8,947	251,691	4,830	1.10	31
Idaho	All Workings	FS-Reg.	5,349	10,586	535,942	3,893	1.98	100
Idaho	All Workings	Total	13,499	19,533	787,633	8,723	1.45	58

TABLE 5

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
ST. JOE OPERATION

State	Working	Acres Worked															
		By Forest Service					By Bureau of Entomology and Plant Quarantine					Total					
												Federal		Other			Total
		National Forest	Public Domain	State	Private	Total	National Forest	Public Domain	State	Private	Total	National Forest	Public Domain	State	Private	Total	
Idaho	First	193			69	262	22		5	32	59	215		5	101	106	321
	Second	997		37	120	1,154	1,125	10	353	480	1,968	2,122	10	390	600	990	3,122
	Third	2,784	123	557	469	3,933	1,725	201	1,358	2,839	6,123	4,509	324	1,915	3,308	5,223	10,056
	Total	3,974	123	594	658	5,349	2,872	211	1,716	3,351	8,150	6,846	334	2,310	4,009	6,319	13,499

TABLE 6

RIBES SPECIES ERADICATED, 1946
ST. JOE OPERATION

Working	Eradication Type	Acres	Ribes Species					Total Ribes
			Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes inerme	Ribes triste	
First	Reproduction (1910-39)	300	295,842	114,478				410,320
	Stream	21	8,249		6,620			14,869
	All Types	321	304,091	114,478	6,620			425,189
Socond	Plantation (1940-44)	398	2,258	547				2,805
	Cutover (1920-39)	56	1,488	5,741	21			7,250
	Reproduction (1910-39)	2,411	49,653	22,699	182			72,534
	Pole	241	95	32	62	82		271
	Stream	16	280	94	2,460			2,834
	All Types	3,122	53,774	29,113	2,725	82		85,694
Third	Cutover (1920-39)	1,555	16,184	37,238	16			53,438
	Reproduction (1910-39)	5,690	55,603	66,881	282			122,766
	Pole	1,055	1,776	2,308	130	19		4,233
	Stream	1,756	14,404	29	81,580		300	96,313
	All Types	10,056	87,967	106,456	82,008	19	300	276,750
All Workings	Plantation (1940-44)	398	2,258	547				2,805
	Cutover (1920-39)	1,611	17,672	42,979	37			60,688
	Reproduction (1910-39)	8,401	401,098	204,058	464			605,620
	Pole	1,296	1,871	2,340	192	101		4,504
	Stream	1,793	22,933	123	90,660		300	114,016
	All Types	13,499	445,832	250,047	91,353	101	300	787,633

TABLE 7

SUMMARY OF RIBES ERADICATION, 1929-1946
ST. JOE OPERATION

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre		Net Acreage Remaining	
						Man-Days	Ribes	Worked	Unworked
First	Cutover	1945-49							1,838
	Cutover	1940-44	308	221	14,730	.72	48	308	34,933
	Plantation	1940-44	2,209	4,763	1,092,843	2.16	495	2,209	
	Cutover	1920-39	16,291	11,381	3,596,739	.70	221	16,291	156,962
	Reproduction	1910-39	217,901	241,186	81,166,676	1.11	372	217,901	104,772
	Pole		86,838	33,082	7,780,055	.38	90	86,750	18,516
	Mature		177,162	68,756	17,998,538	.39	102	120,397	85,906
	Miscellaneous		2,652	2,297	767,429	.87	289	2,652	
	Stream (1)		35,490	97,223	23,373,577	2.74	659	35,490	
	Total		538,851	458,909	135,790,587	.85	252	481,998	402,927
Second	Plantation	1940-44	1,143	1,063	56,187	.93	49	1,143	
	Cutover	1920-39	7,102	7,622	531,496	1.07	75	7,102	
	Reproduction	1910-39	80,911	97,098	9,148,630	1.20	113	80,911	
	Pole		37,089	21,748	1,318,379	.59	36	37,001	
	Mature		8,965	6,831	821,719	.76	92	8,055	
	Miscellaneous		431	43	2,567	.10	6	431	
	Stream (2)		12,654	27,585	5,194,326	2.18	410	12,654	
	Total		148,295	161,990	17,073,304	1.09	115	147,297	
Third	Plantation	1940-44	242	300	12,479	1.24	52	242	
	Cutover	1920-39	1,760	2,093	55,526	1.19	32	1,760	
	Reproduction	1910-39	27,204	46,660	999,653	1.72	37	27,204	
	Pole		5,680	3,302	78,325	.58	14	5,680	
	Mature		170	325	38,042	1.91	224	170	
	Stream (3)		9,460	16,000	1,802,236	1.69	191	9,460	
	Total		44,516	68,680	2,986,2[illegible]1	1.54	67	44,516	
All Workings	Cutover	1940-44	308	221	14,730	.72	48	308	
	Plantation	1940-44	3,594	6,126	1,161,509	1.70	323	3,594	
	Cutover	1920-39	25,153	21,096	4,183,761	.84	166	25,153	
	Reproduction	1910-39	326,016	384,944	91,314,959	1.18	280	326,016	
	Pole		129,607	58,132	9,176,759	.45	71	129,451	
	Mature		186,297	75,912	18,858,299	.41	101	128,622	
	Miscellaneous		3,083	2,340	769,996	.76	250	3,083	
	Stream (4)		57,604	140,808	30,370,139	2.44	527	57,604	
	Total		731,662	689,579	155,850,152	.94	213	673,811	

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	7,420	21,733	670,368
(2)	3,261	4,761	111,909
(3)	2,799	3,206	28,162
(4)	13,480	29,700	810,439

TABLE 8

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1929-1946
ST. JOE OPERATION

State	Class	Gross Acres	Man-Days	Total Ribes	Gallons Spray	Per Acre	
						Man-Days	Ribes
Idaho	EQ-Coop.	45,694	41,706	4,911,360	64,944	.91	107
	EQ-Emerg.	234,519	157,898	43,593,387	77,088	.67	186
	FS-Reg.	188,226	219,492	35,121,996	318,225	1.17	187
	FS-Emerg.	70,981	45,138	15,333,106	101,476	.64	216
	CCC	192,242	225,345	56,890,303	248,706	1.17	296
	Total	731,662	689,579	155,850,152	810,439	.94	213

TABLE 9

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1929-1946
ST. JOE OPERATION

State	Ownership	Net Acres in Control Area					
		Acres Worked				Acres Unworked	Total Acres
		First	Second	Third	Total		
Idaho	National Forest	215,199	79,101	24,470	318,770	97,009	312,208
	Public Domain	12,458	5,169	1,678	19,305	12,007	24,465
	Subtotal Federal	227,657	84,270	26,148	338,075	109,016	336,673
	State	57,903	19,603	5,468	82,974	57,166	115,069
	Private	196,438	43,424	12,900	252,762	236,745	433,183
	Subtotal Other	254,341	63,027	18,368	335,736	293,911	548,252
	Total	481,998	147,297	44,516	673,811	402,927	884,925

BLISTER RUST CONTROL WORK, COEUR D'ALENE OPERATION, 1946

By
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INTRODUCTION

Heavy snows that were late in withdrawing prevented an early start on the 1946 ribes eradication program. The road was not cleared into Jordan Creek, the site of the first camp, until May 20. On June 4, ribes eradication was started here and at the Lone Cabin Camp. The last camp was closed on September 13.

Seven camp sites were occupied, three of which (Jordan, Lone Cabin and Hudlow) were built to accommodate 60 men each. In addition, six men were used for a short time on the Steamboat Timber Sale area. A total of 335 was employed at the peak of the season. All work was performed on lands held in Federal ownership and was financed by regular Forest Service appropriations.

As in the past few years, the principal source of labor was the teen-age class of boys. As a group, they are mostly untrained to work at all, which, coupled with a shortage of competent supervisory personnel, creates an unfavorable labor situation. With this type of labor, it is difficult to meet the eradication standards without considerable rework, hence production is seriously curtailed.

Fire fighting again called heavily on the personnel assigned to the blister rust project. Practically no blister rust work was accomplished during the month of August due to these interruptions. It is estimated that five weeks represented the average effective time obtained from each worker on blister rust control. This short season cannot be avoided when blister rust employees are the only sizeable crews available for fire fighting and teen-age boys comprise the labor force.

The Forest Service was responsible for the administration and operation of the camps, and technical supervision was provided by the Bureau of Entomology and Plant Quarantine.

LOCATION AND DESCRIPTION OF AREAS

1. Jordan Camp, working unit Nos. 31 and 32. This area is located in secs. 4, 7, 8, 9 and 17 of T. 53 N., R. 3 E. Most of the work was performed on natural reproduction areas which border on plantations of 1924 origin. Working conditions were generally very difficult, both on initial and rework areas. Some maintenance work was performed on the plantations proper and this phase of control work will be extended next year. Ribes eradication was commenced June 4 and discontinued on September 12, at which time there were only six field men remaining. Pine infection on this area is quite spotted but generally light.

2. Lone Cabin Camp, working unit No. 1. The work area is located in secs. 18, 19 and 20 of T. 51 N., R. 1 W., and secs. 13, 22, 24 and 25 of T. 51 N., R. 2 W. This crew commenced ribes eradication June 4 and the camp was closed August 30. All control efforts represented rework on lands cut over in 1929 from which the seed trees were removed in 1941-1942, and 20 acres of pole on which rework was not completed in 1945. Small suppressed Ribes lacustre are intermingled with brush on the cutover areas, and it is thought that these troublesome bushes are to some degree responsible for the build-up of pine infection present. This probability was made the subject of an investigative study conducted in connection with ribes eradication on the Deception Creek Experimental Forest. The intensity of the disease is best indicated by the results of the pruning work which was an extension of that reported in 1945 on Lone Cabin drainage. A total of 219 man-days were expended treating 113,022 trees. Of this number, 21,131, or 18.7 per cent, were removed because of killing cankers already present on the trunk. Thousands of trees were saved by the pruning.

3. Nowhere Camp, working unit Nos. 25 and 38. Work was performed in secs. 4, 5, 6, 7 and 8 of T. 51 N., R. 3 E., secs. 13, 14, 23 and 24 of T. 52 N., R. 2 E. and secs. 17, 19, 29, 32 and 33 of T. 52 N., R. 3 E. This camp was started on ribes eradication June 10 and was closed September 3. Maintenance work was performed on two areas near Bennett and Cardinal Creeks on which the residual hemlock was girdled following logging in 1918-1922. About 50 per cent of the Flat Creek burn, which was planted in 1941, was given a second working, the remainder having reached a maintenance status as a result of one working. Rework on the Nowhere plantation was completed and the area worked also represents an extension of the protection afforded to the more recent Brett Creek plantation. The stream type and flat at the mouth of President Creek were given a mop-up. About five acres of R. viscosissimum were removed from Chicago Point. These bushes were capable of casting sporidia on reproduction stands below. Infection on these areas, judging from observations, will vary from 5 to 20 per cent.

4. Hudlow Camp, working unit Nos. 2, 3, 4 and 5. Areas worked were located in secs. 23 and 24 of T. 52 N., R. 2 W., and secs. 5, 7, 8, 9, 17, 18, 19, 20, 21, 28, 30 and 31 of T. 52 N., R. 1 W. This camp commenced work June 11 and was closed September 13. All of the areas worked have been logged since 1933, followed by some form of rehabilitation, such as hemlock removal or broadcast burning. Frog Creek, Tom Lavin, Lewelling and the Middle and East Forks of Hudlow were all reworked. Because of the small bush problem, most of these stands will have to be worked again. First working was initiated on the Iron Creek cutover area lying between Rableus Fork and Moose Creek, and rework of the Solitaire Creek plantation area was started. Disease is well established in these areas following its first big build-up in 1937. Hudlow Camp will be occupied again next year and ribes eradication on these young pine areas extended.

5. Deception Creek Camp, working unit No. 10. Work was started at this camp on June 18 and ceased on August 22. Areas were located in secs. 28, 29, 30, 31 and 32 of T. 51 N., R. 1 W. All work was on areas which have been subjected to some kind of treatment by the Northern Rocky Mountain Experiment Station on Sands Creek, Ames Creek, Deception Creek and Finger Gulch. The

Ames Creek work was supervised by Richard T. Bingham, who recorded data designed to determine the disease-spreading potentialities of suppressed R. lacustre. His figures show about 8 per cent infection with practically all of it damaging. The full text of this report is to be found in the Ecology section of the Northwestern Region annual report.

6. Independence Camp, working unit No. 27. This camp performed rework in the head of Owl Creek in secs. 1 and 2 of T. 52 N., R. 1 E. This camp was established June 25 and closed August 27. Part of this area has been planted and the remainder has natural reproduction. Due to the short time the camp was in operation, and interruptions caused by fire calls, very little was accomplished. Pine infection is probably less than five per cent for this area.

7. Trail Creek Camp, working unit No. 21. This camp started ribes eradication July 2 and was closed August 19. Rework was performed on areas in secs. 22 and 23 of T. 52 N., R. 1 E. This area has very good natural reproduction which was established following the 1910 burn. Working conditions are quite difficult. Little control work was accomplished as this camp had a very short season. Pine infection is quite heavy but due to the advanced age class, not very damaging.

8. Steamboat Creek, working unit No. 43. Work was performed in secs. 26, 27, 34 and 35 of T. 51 N., R. 2 E., during August by a six man fire suppression crew. This area was clear-cut except for seed trees and unmerchantable saw timber, in 1943 and 1944. The canopy was opened sufficiently to permit both pine and ribes germination on much of the area. The purpose of this work was to remove the infected ribes by a fast working to prevent heavy pine infection from becoming established. There were 4,595 ribes eradicated from 175 acres at an expenditure of 119 man-days, or at a rate of 26 ribes and .68 man-days per acre. No particular effort was made to get all of the ribes seedlings since the end of the germination period has not yet been reached.

WORKING METHODS

The general practice was to organize a camp into three-man crews, and then, depending upon available supervision, work them in adjacent strips or assign each crew a small block of its own. Men capable of acting in a foreman capacity were at a premium, but whenever possible, three or four crews were placed under the direct supervision of a straw boss. All methods of crew organization were given trial and that plan adopted which seemed to give the best results for that particular area.

In all camps, initial training on ribes eradication was given by a member of the permanent staff. Thereafter, late-comers or replacements were trained by the camp boss. One perplexing problem has been presenting itself recently in some areas: Ribes have been reduced to the point where it is difficult to find satisfactory training areas reasonably near to camp establishment. To enable crewmen to develop the knack of spotting ribes, they should be trained on areas supporting fifty or more bushes per acre. Many large areas have had the ribes reduced far below this point.

CHECKING AND SURVEYS

Sixteen checkers were used at one time or another during the season, five of whom were experienced from the previous year. Besides checking the current season's work, these men were used on three types of special surveys.

A seven-man crew working from Beaver Station ran 61 miles of strip on which stocking data, ribes count and disease information were recorded. Also, the limits of high fire hazard areas were determined. From these data, it was decided to defer work on the area until the entire unit has been rehabilitated. The results of the infection study are tabulated under disease survey.

An aggressive post checking program covered the following areas to be worked in the near future.

	Miles of Strip
Flat Creek	7.3
Big Elk Creek	2.8
Little Elk Creek	5.9
Short Creek	7.5
Riley Creek Area	11.0
Upper Tepee Creek	30.3
Fern Creek	15.6
Squeak Creek	11.9
Independence Creek	36.8
Jordan Plantation	96.2
Total	225.3

Disease survey activities were postponed until late fall after it was necessary to discontinue post checking. Due to the reduced number of personnel, only special areas were inspected, other than the large area near Beaver Station. The results of this survey are tabulated below:

Area	Miles Strip	Trees Examined	Trees Infected	Per cent Trees Infected
Beaver Station, secs. 13, 22, 23, 24, 26, 27, T. 54 N., R. 1 E.; secs. 18, 19, 20, 29, 30, 32, T. 54 N., R. 2 E.	61.0	3,171	194	6.1
West Elk Creek, secs. 14, 15, 22, 23, 24, 25, 30, T. 53 N., R. 2 E.	13.7	5,344	149	2.8
Trail Creek, secs. 23, 26, T. 52 N., R. 1 E.	1.9	658	56	8.5
East Fork Plantation, secs. 29, 30, 31, 32, T. 53 N., R. 2 E.	6.2	1,754	99	5.6

West Elk was given first working in 1936 and a second working on part of it is contemplated for next year. Most of the Trail Creek area has received one working but the unworked portion runs heavy to ribes. The East Fork Plantation is unworked, though it is in the work plans for 1947. The rust build-up is not considered high for any of these areas.

Area classification for the operation was virtually completed in 1946. Exceptions are areas in the Magee District, an area near the mouth of the North Fork, Coeur d'Alene River, a few isolated areas of a section or less and refinement of some of the earlier classifications. With the information now available, it will be possible to quite carefully delimit all existing white pine growing areas and make recommendations for rehabilitating those capable of growing white pine. A disturbing situation was noted during the progress of the area classification, and that is the spread of a disease, as yet unidentified, that is ravaging some of the better white pine pole stands on the forest. It was first noted in the Cedar Creek Canyon alongside of Highway No. 10 but has since become evident almost everywhere this age class of timber exists. The original center has already passed from a class I area to a class II, and may soon cease to be a white pine type altogether. The situation is more alarming when it is realized that the disease seems to attack that age class which is in such short supply. Definite survey and control action is needed; the situation is serious.

CONTROL STATUS

Until the area classification summary is completed and the status of areas thus surveyed is determined, any figure listed showing status of control would be very much of an estimate. Approximately 40,000 acres are in need of a post check at the present time. A concerted effort will be made to bring this program up to date in the next two years. Because of the quality of labor, the age class of the stands and the number of ribes removed, very little of the area worked in 1946 can be placed on a maintenance basis.

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures is shown in the following tables by the cooperative agency and the type of appropriation.

TABLE 1
EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
COEUR D'ALENE OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 6,380.20
Forest Service	Regular BLR-4	174,417.11
Total		$180,797.31

TABLE 2

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
COEUR D'ALENE OPERATION

Item	Bureau of Entomology and Plant Quarantine Regular BLR-1-4	Forest Service Regular BLR-4	Total
Sal. perm. men	$6,163.94	$ 5,968.70	$ 12,132.64
Sal. temp. men		24,690.15	24,690.15
Wages, temp. labs.		105,131.89	105,131.89
Subs. supplies		28,033.57	28,033.57
Equipment		4,833.03	4,833.03
Travel and Transp.	213.76	2,380.49	2,594.25
Other supplies	2.50	3,379.28	3,381.78
Total	$6,380.20	$174,417.11	$180,797.31

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
COEUR D'ALENE OPERATION

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
First	Cutover	1940-44	175	119	5,065	.68	29
	Cutover	1920-39	189	485	67,742	2.57	358
	Reproduction	1910-39	101	290	17,406	2.87	172
	Pole		27	25	2,683	.93	99
	Stream		7	66	6,189	9.43	884
	Total		499	985	99,085	1.97	199
Second	Cutover	1920-39	451	600	44,764	1.33	99
	Reproduction	1910-39	1,111	2,039	95,579	1.84	86
	Pole		25	43	1,737	1.72	69
	Mature		64	46	2,695	.72	42
	Stream		16	94	7,851	5.88	491
	Total		1,667	2,822	152,626	1.69	92
Third	Cutover	1920-39	1,079	1,910	105,131	1.77	97
	Reproduction	1910-39	970	1,324	38,286	1.36	39
	Pole		77	117	11,939	1.52	155
	Mature		140	137	6,771	.98	48
	Miscellaneous		48	61	2,145	1.27	45
	Stream		172	201	10,035	1.17	58
	Total		2,486	3,750	174,307	1.51	70
All Workings	Cutover	1940-44	175	119	5,065	.68	29
	Cutover	1920-39	1,719	2,995	217,637	1.74	127
	Reproduction	1910-39	2,182	3,653	151,271	1.67	69
	Pole		129	185	16,359	1.43	127
	Mature		204	183	9,466	.90	46
	Miscellaneous		48	61	2,145	1.27	45
	Stream		195	361	24,075	1.85	123
	Total		4,652	7,557	426,018	1.62	92

TABLE 4

RIBES SPECIES ERADICATED, 1946
COEUR D'ALENE OPERATION

Working	Eradication Type	Acres	Ribes Species: Ribes lacustre	Ribes Species: Ribes viscosissimum	Ribes Species: Ribes inerme	Total Ribes
First	Cutover (1940-44)	175	247	4,818		5,065
	Cutover (1920-39)	189	67,123	619		67,742
	Reproduction (1910-39)	101	17,197	209		17,406
	Pole	27	2,665	18		2,683
	Stream	7	6,189			6,189
	All Types	499	93,421	5,664		99,085
Second	Cutover (1920-39)	451	40,921	3,843		44,764
	Reproduction (1910-39)	1,111	92,287	3,281	11	95,579
	Pole	25	1,191	546		1,737
	Mature	64	2,695			2,695
	Stream	16	7,851			7,851
	All Types	1,667	144,945	7,670	11	152,626
Third	Cutover (1920-39)	1,079	92,907	12,224		105,131
	Reproduction (1910-39)	970	29,196	9,090		38,286
	Pole	77	11,100	839		11,939
	Mature	140	6,771			6,771
	Miscellaneous	48	1,436	709		2,145
	Stream	172	8,981		1,054	10,035
	All Types	2,486	150,391	22,862	1,054	174,307
All Workings	Cutover (1940-44)	175	247	4,818		5,065
	Cutover (1920-39)	1,719	200,951	16,686		217,637
	Reproduction (1910-39)	2,182	138,680	12,580	11	151,271
	Pole	129	14,956	1,403		16,359
	Mature	204	9,466			9,466
	Miscellaneous	48	1,436	709		2,145
	Stream	195	23,021		1,054	24,075
	All Types	4,652	388,757	36,196	1,065	426,018

TABLE 5

SUMMARY OF RIBES ERADICATION, 1927 - 1946
COEUR D'ALENE OPERATION

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre		Net Acreage Remaining	
						Man-Days	Ribes	Worked	Unworked
First	Plantation	1945-49	715	403	9,547	.56	13	715	
	Cutover	1940-44	175	119	5,065	.68	29	175	10,593
	Burn	1940-44	716	351	53,652	.49	75	716	246
	Plantation	1940-44	992	1,920	465,201	1.94	469	992	227
	Cutover	1920-39	16,420	21,569	5,382,455	1.31	328	16,420	19,189
	Reproduction	1910-39	89,737	139,402	20,717,549	1.55	231	87,974	10,712
	Pole		65,893	31,279	4,482,605	.47	68	65,157	9,538
	Mature		141,096	87,729	13,798,358	.62	98	123,079	7,390
	Miscellaneous		13,333	16,695	2,965,945	1.25	222	12,909	304
	Stream		14,875	57,772	11,822,133	3.88	795	14,767	2,648
	Total		344,012	357,239	59,702,510	1.04	174	322,904	60,847
Second	Plantation	1940-44	618	1,529	130,960	2.47	212	618	
	Cutover	1920-39	9,389	13,368	1,969,695	1.42	210	9,389	
	Reproduction	1910-39	18,398	30,943	1,920,415	1.68	104	17,665	
	Pole		4,841	3,136	487,525	.65	101	4,841	
	Mature		10,182	8,117	813,461	.80	80	9,882	
	Miscellaneous		1,585	2,963	358,052	1.87	226	1,585	
	Stream		7,803	14,287	1,568,802	1.83	201	7,695	
	Total		52,816	74,343	7,248,910	1.41	137	51,675	
Third	Plantation	1940-44	513	919	51,175	1.79	100	513	
	Cutover	1920-39	4,325	7,974	393,718	1.84	92	4,325	
	Reproduction	1910-39	4,493	7,216	270,275	1.61	60	3,886	
	Pole		826	796	64,083	.96	78	826	
	Mature		1,853	1,373	77,381	.74	42	1,853	
	Miscellaneous		61	72	3,569	1.18	59	61	
	Stream		1,637	2,815	142,016	1.72	87	1,637	
	Total		13,708	21,165	1,007,217	1.54	73	13,101	
All Workings	Plantation	1945-49	715	403	9,547	.56	13	715	
	Cutover	1940-44	175	119	5,065	.68	29	175	
	Burn	1940-44	716	351	53,652	.49	75	716	
	Plantation	1940-44	2,123	4,368	647,336	2.06	305	2,123	
	Cutover	1920-39	30,134	42,911	7,750,868	1.42	257	30,134	
	Reproduction	1910-39	112,688	177,561	22,908,239	1.58	203	109,525	
	Pole		71,560	35,211	5,034,213	.49	70	70,824	
	Mature		153,131	97,219	14,689,200	.63	96	134,814	
	Miscellaneous		14,979	19,730	3,327,566	1.32	222	14,555	
	Stream		24,315	74,874	13,532,951	3.08	557	24,099	
	Total		410,536	452,747	67,958,637	1.10	166	387,680	

TABLE 6

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1927 - 1946
COEUR D'ALENE OPERATION

State	Class	Acres	Man-Days	Ribes	Per Acre	
					Man-Days	Ribes
Idaho	EQ-Reg.	25,776	8,351	2,846,383	.32	110
	EQ-Emerg.	41,039	35,541	6,589,217	.86	161
	FS-Reg.	83,739	101,956	14,757,405	1.22	176
	FS-Emerg.	111,711	86,897	17,620,173	.78	158
	CCC	148,271	220,002	26,145,459	1.48	176
	Total	410,536	452,747	67,958,637	1.10	166

TABLE 7

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1927 - 1946
COEUR D'ALENE OPERATION

State	Ownership	Net Acres in Control Area					
		Acres Worked				Acres Unworked	Total Acres
		First	Second	Third	Total		
Idaho	National Forest	306,760	49,431	12,972	369,163	53,896	360,656
	State	5,427	440	45	5,912	711	6,138
	Private	10,717	1,804	84	12,605	6,240	16,957
	Subtotal Other	16,144	2,244	129	18,517	6,951	23,095
	Total	322,904	51,675	13,101	387,680	60,847	383,751

BLISTER RUST CONTROL WORK, KANIKSU OPERATION, 1946

By
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INTRODUCTION

The Blister Rust control program on the Kaniksu National Forest during the 1946 field season consisted of six camps administered by the Bureau of Entomology and Plant Quarantine and six camps administered by the Forest Service. The bulk of the work was performed on areas of high priority pole, reproduction stands and recent cutover areas in Bonner and Boundary Counties in Idaho and Pend Oreille County in Washington.

The season was again characterized by a dearth of older and experienced workers. This resulted in the recruitment of teen-age boys from local high schools. Some boys were not available until after June 1; some had to return to school by August 25, thus making a short field season. The project was somewhat more fortunate than for the past several years in that more experienced foremen and camp superintendents were available. Turnover in personnel still seems to be a major difficulty in keeping the camps filled. In order to minimize this turnover which in many cases is caused by homesickness, recreation trips, athletic facilities and inter-camp athletic competition were promoted as much as possible. In addition to the short season, accomplishments were materially reduced by crews being called out for fire suppression. A total of 714 man-days by the Bureau of Entomology and Plant Quarantine and 2,392 man-days by the Forest Service blister rust crews were spent on fire suppression work. The interruption caused by the fires came in August when the camps were operating at peak efficiency which was never again reached after the crews returned.

The first ribes eradication was done at Bureau Camp 401 on Pack River near Sandpoint, Idaho, on May 20. Good weather conditions prevailed throughout the season for most of the camps except for two Bureau camps in the vicinity of the upper Priest River drainage which lost approximately six work days each during the month of June. Due to the inability to secure workers one Bureau and two Forest Service camps were not manned until the last week in June. The Forest Service secured 140 Mexican Nationals through the War Food Administration during July which were used on regular eradication work, These workers stayed until September 26. All other Forest Service camps were closed during the last week in August. During the season a total of 16,279 acres were worked by Bureau camps, of which 1,890 acres were initial and 14,389 acres second and third workings. The Forest Service worked a total of 7,721 acres, of which 1,842 acres were initial and 5,879 acres second and third workings. The following accomplishments were made by the different classes of labor.

Ribes Eradication

Labor	Number Workers	Acres	Man-days	Ribes
E. Q. Student	275	16,279	8,241	373,377
F. S. Student	120	6,109	5,411	876,849
F. S. Mexican Labor	142	1,612	2,603	426,495
Total	537	24,000	16,255	1,676,721

ORGANIZATION AND ADMINISTRATION

Blister Rust control work on the Kaniksu operation was administered in accordance with the cooperative working agreement between the Bureau of Entomology and Plant Quarantine and the Forest Service. Full responsibility for the administration of the regular Forest Service camps came within the jurisdiction of the Forest Service personnel. Technical advice and training assistance were afforded by the Bureau of Entomology and Plant Quarantine personnel. All phases of the work on State, private and intermingled Federal lands were administered by Bureau of Entomology and Plant Quarantine personnel. Mr. Kermit Miller, who was on the project during 1940 and 1941, was appointed Blister Rust Staff Man by the Forest Service and assigned to the Kaniksu Project.

Blister Rust Headquarters on Kalispell Bay served as the operation headquarters for both Forest Service and Bureau camps. The clerical work necessary for the ordering and handling of supplies and equipment, preparation of pay rolls, property records, etc., was handled respectively by Forest Service and Bureau clerks and warehousemen. Supplies and equipment were delivered from Spokane by motor freight. Deliveries were made to the individual camps at least once a week by delivery trucks operating out of headquarters. Two Bureau camps located in the vicinity of Upper Priest Lake were serviced by boat and pack stock. Packing service was secured through cooperation from the Forest Service. The organization on the project was as follows:

Bureau of Entomology and Plant Quarantine

H. A. Brischle, Operation Supervisor
J. C. Gynn, Assistant Operation Supervisor
L. J. Easley, Unit Supervisor
G. M. Houghton, Checking Supervisor

U. S. Forest Service

Kermit Miller, Forest Officer
M. C. Aaberg, Unit Supervisor
N. C. Perring, Unit Supervisor

Program	Number of Camps	Number Workers	Number Checkers
FS-Regular	3	120	3
FS-Regular Mexican	3	142	3
EQ-Cooperative	6	275	6
		537	

CHECKING AND PINE DISEASE SURVEY

The checking organization was composed of six checkers from the Forest Service and five from the Bureau. In addition the Bureau had one senior checker and two checker foremen. The latter two supervised the checking work in both the Forest and Bureau camps. All of the checkers employed had at least two years of previous experience in blister rust control work. Eight of the checkers were experienced. The others were chosen for this work for their ability to find ribes.

All but 300 of the 24,000 acres worked were checked. The unchecked area in Lamb Creek has been deferred until the spring of 1947. In addition to the check on the current season's work, 5,000 acres of post check was completed, and classified, 1,500 acres of maintenance and 3,500 acres of rework.

Some areas were checked by a checker flanker method. This method consisted of the checker running his regular 16 foot strip aided by one flanker who ran a meandering course adjacent to the checker. All of the ribes found were recorded as on regular check. Ten per cent of the area was covered when this method was employed and it afforded a good means of locating scattered ribes.

After the completion of the regular season's work, a party of six men conducted an advance check on some areas to be worked next year. Training areas for the eradication crews were located, and the extent of the control work was determined. This party also conducted a pine disease survey on the 1926 burn areas of the Tillicum Creek, South Fork of Granite Creek and Cache Creek drainages. A survey was made on two plantations. They were the 1940 Kalispell Creek and the 1937 Quartz Creek plantations. The heavy spread of rust in 1941 is evidenced in the 1926 burn areas. The two plantations are growing nicely and the spread of the rust in them has been well controlled. The results of these surveys are tabulated below:

Kalispell Creek Drainage (Virgin Creek)

Number of trees examined	1,066
Number of trees infected	38
Per cent of trees infected	3.6
Per cent of trees with killing cankers*	3.5

Quartz Creek Plantation

Number of trees examined	1,312
Number of trees infected	165
Per cent of trees infected	12
Per cent of trees with killing cankers*	10

*Cankers on the trunks of the trees and cankers on the limbs that may spread from the limbs into the trunks.

Tillicum Creek

Number of trees examined	2,777
Number of trees infected	819
Per cent of trees infected	30
Per cent of trees with killing cankers*	29

Cache Creek

Number of trees examined	661
Number of trees infected	294
Per cent of trees infected	44
Per cent of trees with killing cankers*	35

South Fork of Granite Creek

Number of trees examined	855
Number of trees infected	379
Per cent of trees infected	44
Per cent of trees with killing cankers*	36

DESCRIPTION AND LOCATION OF WORK AREAS

Camp 401 T. 60 N., R. 2 W., sec. 21
Located at mouth of Jeru Creek on Pack River. All work was in white pine reproduction and pole stands with the exception of a small amount of protection zone expansion in cutover and mature bordering the area. This area is an old double burn and previous workings had left light scattered ribes distributed over most of the area thus making it possible to use the checker flanker method. After final check, 2,539 acres were placed on maintenance, 220 acres on post check and 240 acres on rework.

Camp 402 T. 57 N., R. 3 W., sec. 1
Located on Fox Creek. Work area was in old cutover and single burn areas supporting good reproduction and pole stands of white pine. Ground cover was very dense with Ribes viscosissimum and R. lacustre generally scattered over the area. Many small upland streams bordered with brush and alder thickets were encountered making ribes eradication difficult. Checking results show most of the area will be placed on post check for further inspection.

Camp 403 T. 63 N., R. 4 W., sec. 17
Located on lower Trapper Creek one mile above Upper Priest Lake. Area in old double burn now supporting excellent stand of white pine pole. Area was worked previously in 1932. The checker flanker method was used on much of the area. After final check, 3,729 acres were placed on maintenance and 320 acres on post check.

*Cankers on the trunks of the trees and cankers on the limbs that may spread from the limbs into the trunks.

Camp 404 T. 63 N., R. 4 W., sec. 5

Located five miles above Upper Priest Lake on Trapper Creek. Camp area was a continuation of the Camp 403 area. This area also supports an excellent stand of white pine pole in an old double burn. A small amount of mature was worked bordering the area as a protection zone to the pole. Final checking results placed 1,839 acres on maintenance, 660 acres on post check and 320 acres on rework.

Camp 405 T. 60 N., R. 2 W., sec. 29

Located two and one-half miles above Camp 401 on Upper Jeru Creek. Area worked was old single burn supporting good white pine reproduction. Heavy concentrations of R. lacustre existed on the area which was covered with many windfalls and brush, making ribes eradication extremely difficult. This area was worked to protect not only the reproduction present but also a fine stand of white pine pole immediately below the ribes concentrations.

Camp 406 T. 59 N., R. 2 W., sec. 14

Located one-half mile above Pack River on Caribou Creek. The area worked was white pine pole and reproduction stands on the valley floor along lower Pack River. Previous workings had left light scattered ribes over the area making it possible for the checker flanker method to be used on the upland types with crew work being concentrated on the large amount of stream type existing in this area. After the final check had been made, 2,307 acres were placed on maintenance, 200 acres on post check and 180 acres on rework.

Camp 451 T. 33 N., R. 45 E. W. M., sec. 13

Located in the Boswell area on the Lower West Branch of Priest River. Worked area consisted of two burns, one of 60 acres of 1938 origin from which 490 ribes per acre were removed. The second area of 225 acres was first burned in 1938, snagged during the winter of 1944 and 1945, then control burned in September of 1945. These areas are both excellent white pine sites and are to be planted to white pine in the near future. Checking results indicate that a few seedlings are still coming in, therefore, both areas were placed on rework.

Camp 452 T. 35 N., R. 45 E. W. M., sec. 13

Located in Squaw Valley on the Upper West Branch of Priest River. The area consisted of cutover 1920-1939, reproduction and pole types. Previous workings indicated that the area was approaching a maintenance standard, hence the checker flanker method was used over most of the area. After final check was made, 1,500 acres were placed on maintenance, 1,506 acres on post check and 800 acres on rework.

Camp 453 T. 35 N., R. 45 E. W. M., sec. 2

Located on Lamb Creek. The area consisted of a plantation and protection zone strip. First work, consisting of 309 acres of heavy ribes concentration, was completed around the edge of the Lamb Creek plantation; 787 acres of second and third work was done within the plantation. After the final check was completed, 160 acres were placed on post check, 636 acres on rework and the balance will not be checked until the spring of 1947.

Camp 454 T. 36 N., R. 45 E. W. M., sec. 29
Located on Kalispell Creek. About one half of this area was worked as a protection zone to afford additional protection to the adjacent Kalispell Creek plantation. First work consisting of 210 acres and 246 acres of second work were done. All first work was in extremely heavy ribes and brush. First working removed 1,503 ribes per acre and 129 ribes per acre were removed on second working. After final check, 80 acres were placed on maintenance and 376 acres on rework.

Camp 455 T. 28 N., R. 4 W., sec. 27
Located on Diamond Creek. The area consisted of reproduction and pole stands. Heavy *R. lacustre* in reproduction along the streams constituted the major problem. A total of 1,086 acres were worked. After final check, 636 acres were placed on maintenance and 450 acres on rework. Of this rework area, 200 acres are in major stream type along Diamond Creek.

Camp 456 T. 36 N., R. 46 E. W. M., sec. 7
Located at the Experimental Station. Work area consisted of an experimental cutting strip five chains wide and one mile long. The cutting was made in 1938 and 1939. The area was first worked in 1942 at which time a few large ribes were removed and a very heavy crop of seedlings noted. During the 1946 working, 3,621 ribes per acre were removed. This camp also worked the stream type acreage in the Experimental Station area. The checking results show but a few ribes seedlings remaining in the cutting strip.

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures and costs is shown in the following table by cooperative agency and the type of appropriation:

TABLE 1

EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
KANIKSU OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 28,050.06
	Regular BLR-3-4	136,929.97
	Subtotal	$164,980.03
State of Idaho	State BLR-3-4	$ 7,264.47
Priest Lake Timber Protective Association	Private BLR-3-4	6,965.38
	Subtotal	$ 14,229.85
Forest Service	Regular BLR-4	$188,268.81
Total		$367,478.69

TABLE 2

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
KANIKSU OPERATION

Item	Bureau of Entomology and Plant Quarantine				Forest Service	Total
	Regular BLR-1-4	Regular BLR-3-4	State and Private BLR-3-4	Total	Regular BLR-4	
Sal. perm. men	$16,214.98	$ 800.77		$ 17,015.75	$ 24,489.46	$ 41,505.21
Sal. temp. men	1,258.83	25,461.23	$ 1,452.38	28,172.44	12,527.29	40,699.73
Wages, temp. labs.	5,966.71	67,634.28	12,201.24	85,802.23	95,385.54	181,187.77
Subs. supplies	2,616.54	22,780.94	576.23	25,973.71	31,698.84	57,672.55
Equipment		5,913.63		5,913.63	7,673.40	13,587.03
Trucks		2,850.38		2,850.38		2,850.38
Travel & transp.	720.57	3,517.59		4,238.16	10,345.92	14,584.08
Other supplies	1,272.43	7,971.15		9,243.58	6,148.36	15,391.94
Total	$28,050.06	$136,929.97	$14,229.85	$179,209.88	$188,268.81	$367,478.69

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
KANIKSU OPERATION

Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
First	Burn	1945-49	243	548	111,750	2.26	460
	Cutover	1940-44	223	193	185,767	.87	833
	Cutover	1920-39	728	939	84,123	1.29	116
	Reproduction	1910-39	773	2,385	446,029	3.09	577
	Pole		708	231	6,900	.33	10
	Mature		513	309	16,028	.60	31
	Miscellaneous		343	690	294,813	2.01	860
	Stream		201	317	21,371	1.58	106
	Total		3,732	5,612	1,166,781	1.50	313
Second	Plantation	1940-44	28	46	4,332	1.64	155
	Cutover	1920-39	90	611	24,695	6.79	274
	Reproduction	1910-39	3,698	2,432	122,112	.66	33
	Pole		9,056	2,898	118,991	.32	13
	Mature		282	258	8,083	.91	29
	Miscellaneous		248	123	2,329	.50	9
	Stream		2,103	1,665	69,857	.79	33
	Total		15,505	8,033	350,399	.52	23
Third	Plantation	1940-44	211	35	1,258	.17	6
	Cutover	1920-39	1,651	754	37,074	.46	22
	Reproduction	1910-39	1,528	1,290	35,573	.84	23
	Pole		495	147	29,974	.30	61
	Mature		436	212	48,006	.49	110
	Miscellaneous		368	67	1,237	.18	3
	Stream		74	105	6,419	1.42	87
	Total		4,763	2,610	159,541	.55	33
All Workings	Burn	1945-49	243	548	111,750	2.26	460
	Cutover	1940-44	223	193	185,767	.87	833
	Plantation	1940-44	239	81	5,590	.34	23
	Cutover	1920-39	2,469	2,304	145,892	.93	59
	Reproduction	1910-39	5,999	6,107	603,714	1.02	101
	Pole		10,259	3,276	155,865	.32	15
	Mature		1,231	779	72,117	.63	59
	Miscellaneous		959	880	298,379	.92	311
	Stream		2,378	2,087	97,647	.88	41
	Total		24,000	16,255	1,676,721	.68	70

TABLE 4

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1946
KANIKSU OPERATION

State	Working	Class	Acres	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
Idaho	First	EQ-Coop.	1,890	1,369	96,419	.72	51
		FS-Reg.	361	403	181,219	1.12	502
		Total	2,251	1,772	277,638	.79	123
	Second	EQ-Coop.	10,413	5,047	144,843	.48	14
		FS-Reg.	1,700	1,090	77,920	.64	46
		Total	12,113	6,137	222,763	.51	18
	Third	EQ-Coop.	3,976	1,825	132,115	.46	33
	All Workings	EQ-Coop.	16,279	8,241	373,377	.51	23
		FS-Reg.	2,061	1,493	259,139	.72	126
		Total	18,340	9,734	632,516	.53	34
Washington	First	FS-Reg.	1,481	3,840	889,143	2.59	600
	Second	FS-Reg.	3,392	1,896	127,636	.56	38
	Third	FS-Reg.	787	785	27,426	1.00	35
	All Workings	FS-Reg.	5,660	6,521	1,044,205	1.15	184
Total	First	EQ-Coop.	1,890	1,369	96,419	.72	51
		FS-Reg.	1,842	4,243	1,070,362	2.30	581
		Total	3,732	5,612	1,166,781	1.50	313
	Second	EQ-Coop.	10,413	5,047	144,843	.48	14
		FS-Reg.	5,092	2,986	205,556	.59	40
		Total	15,505	8,033	350,399	.52	23
	Third	EQ-Coop.	3,976	1,825	132,115	.46	33
		FS-Reg.	787	785	27,426	1.00	35
		Total	4,763	2,610	159,541	.55	33
	All Workings	EQ-Coop.	16,279	8,241	373,377	.51	23
		FS-Reg.	7,721	8,014	1,303,344	1.04	169
		Total	24,000	16,255	1,676,721	.68	70

TABLE 5

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
KANIKSU OPERATION

State	Working	Acres Worked											
		By Forest Service			By Bureau of Entomology and Plant Quarantine				Total				
									Federal	Other			
		National Forest	Private	Total	State	Private	Forest Service	Total	National Forest	State	Private	Total	Total
Idaho	First	361		361	1,482	408		1,890	361	1,482	408	1,890	2,251
	Second	1,380	320	1,700	5,342	3,722	1,349	10,413	2,729	5,342	4,042	9,384	12,113
	Third				2,096	920	960	3,976	960	2,096	920	3,016	3,976
	Total	1,741	320	2,061	8,920	5,050	2,309	16,279	4,050	8,920	5,370	14,290	18,340
Washington	First	1,312	169	1,481					1,312		169	169	1,481
	Second	3,257	135	3,392					3,257		135	135	3,392
	Third	787		787					787				787
	Total	5,356	304	5,660					5,356		304	304	5,660
Total	First	1,673	169	1,842	1,482	408		1,890	1,673	1,482	577	2,059	3,732
	Second	4,637	455	5,092	5,342	3,722	1,349	10,413	5,986	5,342	4,177	9,519	15,505
	Third	787		787	2,096	920	960	3,976	1,747	2,096	920	3,016	4,763
	Total	7,097	624	7,721	8,920	5,050	2,309	16,279	9,406	8,920	5,674	14,594	24,000

TABLE 6

RIBES SPECIES ERADICATED, 1946
KANIKSU OPERATION

Working	Eradication Type	Acres	Ribes Species			Total Ribes
			Ribes lacustre	Ribes viscosissimum	Ribes inerme	
First	Burn (1945-49)	243	11,990	99,760		111,750
	Cutover (1940-44)	223	28,656	157,111		185,767
	Cutover (1920-39)	728	83,702	421		84,123
	Reproduction (1910-39)	773	39,957	406,072		446,029
	Pole	708	5,439	1,461		6,900
	Mature	513	15,087	941		16,028
	Miscellaneous	343	16,266	278,417	130	294,813
	Stream	201	20,922	218	231	21,371
	All Types	3,732	222,019	944,401	361	1,166,781
Second	Plantation (1940-44)	28	253	4,079		4,332
	Cutover (1920-39)	90	11,981	12,714		24,695
	Reproduction (1910-39)	3,698	52,087	46,713	23,312	122,112
	Pole	9,056	76,121	40,783	2,087	118,991
	Mature	282	7,731	352		8,083
	Miscellaneous	248	690	1,639		2,329
	Stream	2,103	41,814	334	27,709	69,857
	All Types	15,505	190,677	106,614	53,108	350,399
Third	Plantation (1940-44)	211	147	1,111		1,258
	Cutover (1920-39)	1,651	11,712	25,362		37,074
	Reproduction (1910-39)	1,528	11,720	23,853		35,573
	Pole	495	8,497	21,477		29,974
	Mature	436	7,107	40,899		48,006
	Miscellaneous	368	862	375		1,237
	Stream	74	6,257	162		6,419
	All Types	4,763	46,302	113,239		159,541
All Workings	Burn (1945-49)	243	11,990	99,760		111,750
	Cutover (1940-44)	223	28,656	157,111		185,767
	Plantation (1940-44)	239	400	5,190		5,590
	Cutover (1920-39)	2,469	107,395	38,497		145,892
	Reproduction (1910-39)	5,999	103,764	476,638	23,312	603,714
	Pole	10,259	90,057	63,721	2,087	155,865
	Mature	1,231	29,925	42,192		72,117
	Miscellaneous	959	17,818	280,431	130	298,379
	Stream	2,378	68,993	714	27,940	97,647
	All Types	24,000	458,998	1,164,254	53,469	1,676,721

TABLE 7

SUMMARY OF RIBES ERADICATION, 1923 - 1946
KANIKSU OPERATION

Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre		Net Acreage Remaining	
						Man-Days	Ribes	Worked	Unworked
First	Burn	1945-49	243	548	111,750	2.26	460	243	
	Plantation	1945-49	30	17	1,598	.57	53	30	473
	Cutover	1940-44	3,731	2,904	534,663	.78	143	3,731	45,303*
	Burn	1940-44	210	184	47,333	.88	225	210	
	Plantation	1940-44	2,631	1,317	490,404	.50	186	2,631	
	Cutover	1920-39	11,970	8,713	1,843,942	.73	154	11,396	24,583
	Reproduction	1910-39	165,918	119,065	32,755,662	.72	197	159,299	25,795
	Pole		123,459	43,044	6,052,712	.35	49	122,144	30,364
	Mature		142,498	30,621	5,799,102	.21	41	110,203	39,572
	Miscellaneous		7,297	4,905	1,992,482	.67	273	5,934	1,367
	Stream		22,482	49,533	9,282,358	2.20	413	21,838	7,334
	Total		480,469	260,851	58,912,006	.54	123	437,659	174,791
Second	Cutover	1940-44	352	199	7,107	.57	20	352	
	Plantation	1940-44	2,631	1,435	50,089	.55	19	2,631	
	Cutover	1920-39	6,638	8,838	1,759,832	1.33	265	6,638	
	Reproduction	1910-39	50,462	43,989	5,630,934	.87	112	49,554	
	Pole		27,724	12,264	849,607	.44	31	27,724	
	Mature		6,959	3,904	357,746	.56	51	6,959	
	Miscellaneous		1,056	509	43,394	.48	41	1,056	
	Stream		9,837	13,116	1,276,525	1.33	130	9,782	
	Total		105,659	84,254	9,975,234	.80	94	104,696	
Third	Plantation	1940-44	211	35	1,258	.17	6	211	
	Cutover	1920-39	5,273	4,424	299,559	.84	57	5,273	
	Reproduction	1910-39	15,409	14,997	1,158,938	.97	75	15,409	
	Pole		1,349	482	53,030	.36	39	1,349	
	Mature		900	607	102,271	.67	114	900	
	Miscellaneous		547	189	4,263	.35	8	547	
	Stream		1,182	1,540	68,134	1.30	58	1,182	
	Total		24,871	22,274	1,687,453	.90	68	24,871	
All Workings	Burn	1945-49	243	548	111,750	2.26	460	243	
	Plantation	1945-49	30	17	1,598	.57	53	30	
	Cutover	1940-44	4,083	3,103	541,770	.76	133	4,083	
	Burn	1940-44	210	184	47,333	.88	225	210	
	Plantation	1940-44	5,473	2,787	541,751	.51	99	5,473	
	Cutover	1920-39	23,881	21,975	3,903,333	.92	163	23,307	
	Reproduction	1910-39	231,789	178,051	39,545,534	.77	171	224,262	
	Pole		152,532	55,790	6,955,349	.37	46	151,217	
	Mature		150,357	35,132	6,259,119	.23	42	118,062	
	Miscellaneous		8,900	5,603	2,040,139	.63	229	7,537	
	Stream		33,501	64,189	10,627,017	1.92	317	32,802	
	Total		610,999	367,379	70,574,693	.60	116	567,226	

*Includes 8,500 acres 1945 and 1946 unworked cutover.

TABLE 8

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1923 - 1946
KANIKSU OPERATION

State	Class	Gross Acres	Man-Days	Total Ribes	Per Acre	
					Man-Days	Ribes
Idaho	EQ-Reg.	18,796	6,844	1,066,689	.36	57
	EQ-Coop.	145,650	56,877	11,164,879	.39	77
	EQ-Emerg.	99,041	68,851	11,333,497	.70	114
	FS-Reg.	42,807	41,780	4,908,067	.98	115
	FS-Emerg.	99,269	38,823	8,788,474	.39	89
	CCC	62,419	50,478	8,451,835	.81	135
	Total	467,982	263,653	45,713,441	.56	98
Washington	EQ-Emerg.	31,629	19,288	6,754,071	.61	214
	FS-Reg.	52,694	45,347	10,606,688	.86	201
	FS-Emerg.	36,366	14,386	4,013,260	.40	110
	CCC	22,328	24,705	3,487,233	1.11	156
	Total	143,017	103,726	24,861,252	.73	174
Total	EQ-Reg.	18,796	6,844	1,066,689	.36	57
	EQ-Coop.	145,650	56,877	11,164,879	.39	77
	EQ-Emerg.	130,670	88,139	18,087,568	.67	138
	FS-Reg.	95,501	87,127	15,514,755	.91	162
	FS-Emerg.	135,635	53,209	12,801,734	.39	94
	CCC	84,747	75,183	11,939,068	.89	141
	Total	610,999	367,379	70,574,693	.60	116

TABLE 9

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1923 - 1946
KANIKSU OPERATION

State	Ownership	Net Acres in Control Area					
		Acres Worked				Acres Unworked	Total Acres
		First	Second	Third	Total		
Idaho	National Forest	175,923	38,681	3,595	218,199	59,786	235,709
	Public Domain	54			54	80	134
	Subtotal Federal	175,977	38,681	3,595	218,253	59,866	235,843
	State	103,263	23,562	11,728	138,553	31,774	135,037
	Private	65,340	13,911	2,328	81,579	44,747	110,087
	Subtotal Other	168,603	37,473	14,056	220,132	76,521	245,124
	Total	344,580	76,154	17,651	438,385	136,387	480,967
Washington	National Forest	86,047	26,992	7,028	120,067	34,601	120,648
	Subtotal Federal	86,047	26,992	7,028	120,067	34,601	120,648
	State	2,080			2,080		2,080
	Private	4,952	1,550	192	6,694	3,803	8,755
	Subtotal Other	7,032	1,550	192	8,774	3,803	10,835
	Total	93,079	28,542	7,220	128,841	38,404	131,483
Total	National Forest	261,970	65,673	10,623	338,266	94,387	356,357
	Public Domain	54			54	80	134
	Subtotal Federal	262,024	65,673	10,623	338,320	94,467	356,491
	State	105,343	23,562	11,728	140,633	31,774	137,117
	Private	70,292	15,461	2,520	88,273	48,550	118,842
	Subtotal Other	175,635	39,023	14,248	228,906	80,324	255,959
	Total	437,659	104,696	24,871	567,226	174,791	612,450

BLISTER RUST CONTROL WORK, MONTANA OPERATION, 1946

By
A. S. Skoglund, Operation Supervisor
R. E. Frey, Forester, Cabinet National Forest

INTRODUCTION

Blister rust control was conducted on the Cabinet and Kootenai National Forests of the Montana operation in 1946.

A total of 80,706 acres have been worked initially on the Cabinet Forest and 58,024 acres on the Kootenai Forest.

Practically all the work performed in the Kootenai this past season was initial work in pole class stands, whereas in the Cabinet the work was confined entirely to 1910 and 1919 burned-over lands.

Teen-age boys, Mexican Nationals and war veterans made up the larger share of personnel used on the project. The teen-age boys, as a class, were not as efficient as during the three previous seasons. War veterans were satisfactory with some being outstanding. No problems of rehabilitation and reorientation to blister rust control work were encountered. Due to an increase in the size of the program, it was necessary to train inexperienced men as foremen. These men should, in all cases, provide good supervisory personnel for coming seasons.

As has been the case for years, forest fires on and off the immediate forests required the efforts of all crews for varying amounts of time. These interruptions halt the orderly progress of work not only because of time lost when the men are actually on fire duty, but also due to the tremendous labor turnover immediately after their release from prolonged periods of fire suppression.

ORGANIZATION AND ADMINISTRATION

The respective forests were responsible for the administration and maintenance of the camps and technical supervision was provided by the Bureau of Entomology and Plant Quarantine.

The field organization was as follows:

Bureau of Entomology and Plant Quarantine	U. S. Forest Service
A. S. Skoglund, Operation Supervisor	Neil Fullerton, Forest Officer, Cabinet Forest
	R. E. Frey, Forest Officer
	H. E. Ahlskog, Forest Officer, Kootenai Forest
	E. W. Smith, Forest Officer

Camp Locations

Drainage	T.	R.	S.	Date Established	Date Closed	Class of Labor	Size
				Cabinet National Forest			
Rainy Creek	19N	32W	13	May 27	Aug. 29	Boys	50
W.F. Big Creek	19N	30W	36	July 1	Sept. 23	Mex.	60
M.F. Big Creek	18N	30W	6	June 28	Sept. 11	Boys	33
				Kootenai National Forest			
Burnt Creek	34N	33W	1	May 28	Aug. 29	Boys	45
Burnt Creek	34N	32W	5	June 8	Aug. 18	Boys	45
Red Top Creek	34N	33W	1	June 27	Sept. 3	Boys	33
Yaak River	34N	33W	10	May 20	Sept. 13	Boys	45

LOCATION AND DESCRIPTION OF AREAS

In the Cabinet Forest, work was performed in the Big Creek and Rainy Creek drainages. The work in Rainy Creek was a continuation of the 1945 work. The work in the middle fork of Big Creek completed last year's area around Rivers Peak and extended the area to provide protection on the west side of the plantation. In the West Fork of Big Creek the work area was extended westward on the upper plantation and northward to include a thrifty stand of white pine on a 1919 burn.

In the Kootenai Forest, initial work was accomplished in portions of the upper and lower sections of the Burnt Creek drainage. The lower areas are predominantly very thrifty white pine pole type. The upper areas are mainly white pine reproduction on a 1910 single burn with considerable debris on the ground. The working conditions are rather severe on this particular portion of Burnt Creek.

Both initial and rework were performed on Red Top Creek area. This stand is mainly a 50-year-old white pine pole type with the ribes population on the decline. With the exception of a small amount of rework along the main creek, all work was confined to a basin below Red Top Lookout.

In the Yaak River area, all work was confined to stream type. The west side was a rework job in wide stream type initially worked in 1935. Initial work was performed on the east side of the river. Some parts with high ribes population and severe working conditions were left to be bulldozed this coming season. The area along the Yaak River extends from the confluence of Fourth of July Creek, past Burnt Creek, Little Creek and Cyclone Creek and beyond Red Top and Lucky Creeks, all of which contains fine, thrifty pole stands.

METHODS AND EQUIPMENT

Standard methods were used throughout the season. *Ribes petiolare* was sprayed with the new weedicide, 2,4-D, *R. triste* with a double concentration of

Atlacide and R. lacustre in stream type with a solution of ammonium sulfamate.

A small patch of R. viscosissimum seedlings on cutover lands was sprayed with ammonium sulfamate in the fall of 1945 with very good results. On a check performed one year later, no ribes were found in those portions that were sprayed, whereas, in the unsprayed parts, some ribes were found. With suitable equipment, heavy concentrations of upland ribes can be effectively sprayed at lower costs.

CONTROL STATUS

The status of control in the Cabinet Forest has not materially changed during the last several years. Practically no infection was found in the transplant beds at Savenac Nursery. No infection was found in the two-year-old seed beds. Haugan Lookout area was originally worked in 1942 and reworked in 1945. No favorable year for the spread or intensification of rust has occurred since 1942 until this past season. Present results are very encouraging in that no appreciable infection has been found since working Haugan Lookout; however, the so-called "acid test" will occur next fall when the results of this past favorable spread year may be observed.

The removal, by flankers, of the scattered ribes in the 1924 plantation on Big Creek and the working of the area around Rivers Peak should afford protection from any further serious damage. The slopes across the Middle Fork from this plantation should be planted with Douglas fir and white pine to provide a screening and suppress ribes as well as to utilize the now idle land. This area was burned over in 1910 and reburned in 1919 with very little natural restocking having taken place.

The situation in the West Fork remains the same since practically all the 1946 work was first working immediately adjacent to worked areas. In the past, travel time and man power prohibited the working of areas beyond those originally worked. Very heavy concentrations of ribes were pulled in these areas and this will necessitate a further working in the near future. This additional work affords considerable protection to the thrifty stands in the original area.

Next season it is planned to do further work in the Upper Middle Fork. First working was performed over about two-thirds of the area in 1938 and 1939 with a small amount of rework in 1940. Very heavy spread of infection to white pine took place in the years 1937-1941, and the situation at that time was not very optimistic. Since then the rust has not intensified. Some of this stand was stagnated prior to infection but now the undamaged pines have been released and new reproduction is appearing. Initial work will be performed in reproduction and pole stands further up the drainage tying in with past workings to make a large contiguous block.

No post check was performed in the Kootenai Forest except that in the immediate vicinity of the areas worked in 1946. An extensive pine survey was run on several drainages in the Upper Ford district and in the Fisher River country.

No bodies of white pine were found in the Upper Ford district outside of the present control areas, although several drainages had scattered white pine reproduction and pole. A small stringer found in Basin Creek and one in Bunker Hill Creek were too small to warrant protection. Heavy infection may be found in stream type along the main Yaak River and immediately above the west and North Fork junction.

The west Fisher area contains some marginal blocks of white pine, especially in Trail and Standard Creeks. The white pine occurs in heavy stocking with larch, Douglas fir and lodgepole. The site is very rocky but the ribes and infection are light and scattered. In the Allen Peak country of the Silver Butte Fisher Area, a few small blocks of white pine reproduction extend up into the whitebark pine stands adjacent to the lookout. Very little infection was found in the whitebark pine with the area being substantially ribes-free. The drainage just east of the lookout contains the best body of pine with very little work being required to protect it. In the lower portions of the main drainages the scattered pine were heavily infected, especially in the damp sites.

No new infection was found in the Red Top and Cyclone Creek areas near Sylvanite. The Red Top area has been afforded considerable protection except in the drainage below Red Top Lookout where further work will be necessary in a few years.

A small amount of work was performed in main Burnt Creek with most of the ribes confined to stream type. Some pine infection was found along the stream near the junction of the south fork with the main creek. This area will be worked next year to forestall any serious damage. A small pocket of heavy infection was found along the stream in the Middle Fork of Grizzly Creek and this area will be worked next season. The pole stands north of the main drainage and west of Grizzly Creek are in very good condition with perhaps additional work being necessary only in the upper heavy brush areas. The area should be closely watched to observe whether or not there is any appreciable rust infiltration from this brush area and into the lower stands.

STATEMENT OF EXPENDITURES AND COSTS

The statement of expenditures and costs by cooperative agency and type of appropriation is shown in the following tabulations:

TABLE 1

EXPENDITURES BY APPROPRIATIONS, CALENDAR YEAR 1946
MONTANA OPERATION

Cooperating Agency	Appropriation	Amount
Bureau of Entomology and Plant Quarantine	Regular BLR-1-4	$ 4,561.33
Cabinet National Forest	Regular BLR-4	91,826.00
Kootenai National Forest	Regular BLR-4	80,904.78
Total		$177,292.11

TABLE 2

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
MONTANA OPERATION

Item	Bureau of Entomology and Plant Quarantine Regular BLR-1-4	Cabinet National Forest Regular BLR-4	Kootenai National Forest Regular BLR-4	Total
Sal., perm. men	$4,154.20	$ 6,430.00	$ 5,631.38	$ 16,265.38
Wages, temp. labs.		63,821.00	50,884.85	114,705.85
Subs. supplies		14,998.00	12,623.57	27,621.57
Equipment	9.85	4,482.00	1,590.51	6,082.36
Travel & transp.	382.77	1,108.00	4,035.42	5,526.19
Other supplies	14.51	937.00	6,139.05	7,090.56
Total	$4,561.33	$91,826.00	$80,904.78	$177,292.11

TABLE 3

SUMMARY OF RIBES ERADICATION, 1946
MONTANA OPERATION

Forest	Working	Eradication Type	Year of Origin	Acres	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes
Cabinet	First	Reproduction	1910-39	501	3,682	159,683	7.34	319
		Mature		80	10	374	.13	5
		Stream (1)		20	87	8,498	4.35	425
		Total		601	3,779	168,555	6.29	280
	Second	Reproduction	1910-39	43	117	2,386	2.72	56
		Stream (2)		4	18	4,045	4.50	1,011
		Total		47	135	6,431	2.87	137
	Third and Other	Reproduction	1910-39	308	297	6,771	.96	22
		Stream (3)		83	221	13,143	2.38	141
		Total		391	518	19,914	1.32	51
	All Workings	Reproduction	1910-39	852	4,096	168,840	4.81	198
		Mature		80	10	374	.13	5
		Stream (4)		107	326	25,686	3.05	240
		Total		1,039	4,432	194,900	4.27	188
Kootenai	First	Reproduction	1910-39	346	104	1,230	.30	4
		Pole		1,104	1,391	54,714	1.26	50
		Mature		95	5	57	.05	1
		Stream		240	1,358	40,574	5.66	169
		Total		1,785	2,858	96,575	1.60	54
	Second	Pole		25	17	1,493	.68	60
		Stream		110	217	15,234	1.97	138
		Total		135	234	16,727	1.73	124
	All Workings	Reproduction	1910-39	346	104	1,230	.30	4
		Pole		1,129	1,408	56,207	1.25	50
		Mature		95	5	57	.05	1
		Stream		350	1,575	55,808	4.50	159
		Total		1,920	3,092	113,302	1.61	59
All Forests	First	Reproduction	1910-39	847	3,786	160,913	4.47	190
		Pole		1,104	1,391	54,714	1.26	50
		Mature		175	15	431	.09	2
		Stream (1)		260	1,445	49,072	5.35	182
		Total		2,386	6,637	265,130	2.78	111
	Second	Reproduction	1910-39	43	117	2,386	2.72	56
		Pole		25	17	1,493	.68	60
		Stream (2)		114	235	19,279	2.06	169
		Total		182	369	23,158	2.03	127
	Third and Other	Reproduction	1910-39	308	297	6,771	.96	22
		Stream (3)		83	221	13,143	2.38	141
		Total		391	518	19,914	1.32	51
	All Workings	Reproduction	1910-39	1,198	4,200	170,070	3.51	142
		Pole		1,129	1,408	56,207	1.25	50
		Mature		175	15	431	.09	2
		Stream (4)		457	1,901	81,494	4.16	178
		Total		2,959	7,524	308,202	2.54	104

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	10	20	800
(2)	4	9	275
(3)	10	44	470
(4)	24	73	1,545

TABLE 4

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1946
MONTANA OPERATION

Forest	Working	Acres Worked By Forest Service: National Forest	Private	Total
Cabinet	First	598	3	601
	Second	47		47
	Third	342	49	391
	Total	987	52	1,039
Kootenai	First	1,751	34	1,785
	Second	40	95	135
	Total	1,791	129	1,920
All Forests	First	2,349	37	2,386
	Second	87	95	182
	Third	342	49	391
	Total	2,778	181	2,959

TABLE 5

RIBES SPECIES ERADICATED, 1946
MONTANA OPERATION

Forest	Working	Eradication Type	Acres	Ribes Species: Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes inerme	Ribes irriguum	Ribes triste	Total Ribes
Cabinet	First	Reproduction (1910-39)	501	107,553	52,130					159,683
		Mature	80	374						374
		Stream (1)	20	4,136	3,162	1,200				8,498
		Total	601	112,063	55,292	1,200				168,555
	Second	Reproduction (1910-39)	43	225	2,161					2,386
		Stream (2)	4			4,045				4,045
		Total	47	225	2,161	4,045				6,431
	Third and Other	Reproduction (1910-39)	308	5,767	1,004					6,771
		Stream (3)	83	4,104	1,486	5,227			2,326	13,143
		Total	391	9,871	2,490	5,227			2,326	19,914
	All Workings	Reproduction (1910-39)	852	113,545	55,295					168,840
		Stream (4)	107	8,240	4,648	10,472			2,326	25,686
		Mature	80	374						374
		Total	1,039	122,159	59,943	10,472			2,326	194,900
Kootenai	First	Reproduction (1910-39)	346	1,210				20		1,230
		Pole	1,104	53,885	829					54,714
		Mature	95	57						57
		Stream	240	38,547	71		605	1,351		40,574
		Total	1,785	93,699	900		605	1,371		96,575
	Second	Pole	25	1,493						1,493
		Stream	110	15,225	9					15,234
		Total	135	16,718	9					16,727
	All Workings	Reproduction (1910-39)	346	1,210				20		1,230
		Pole	1,129	55,378	829					56,207
		Mature	95	57						57
		Stream	350	53,772	80		605	1,351		55,808
		Total	1,920	110,417	909		605	1,371		113,302
All Forests	First	Reproduction (1910-39)	847	108,763	52,130			20		160,913
		Pole	1,104	53,885	829					54,714
		Mature	175	431						431
		Stream (1)	260	42,683	3,233	1,200	605	1,351		49,072
		Total	2,386	205,762	56,192	1,200	605	1,371		265,130
	Second	Reproduction (1910-39)	43	225	2,161					2,386
		Pole	25	1,493						1,493
		Stream (2)	114	15,225	9	4,045				19,279
		Total	182	16,943	2,170	4,045				23,158
	Third and Other	Reproduction (1910-39)	308	5,767	1,004					6,771
		Stream (3)	83	4,104	1,486	5,227			2,326	13,143
		Total	391	9,871	2,490	5,227			2,326	19,914
	All Workings	Reproduction (1910-39)	1,198	114,755	55,295			20		170,070
		Pole	1,129	55,378	829					56,207
		Mature	175	431						431
		Stream (4)	457	62,012	4,728	10,472	605	1,351	2,326	81,494
		Total	2,959	232,576	60,852	10,472	605	1,371	2,326	308,202

TABLE 6

SUMMARY OF RIBES ERADICATION, 1923-1946
MONTANA OPERATION

Forest	Working	Eradication Type	Year of Origin	Gross Acres Worked	Man-Days	Ribes	Per Acre Man-Days	Per Acre Ribes	Net Acreage Remaining Worked	Net Acreage Remaining Unworked
Cabinet	First	Raproduction	1910-39	35,431	36,803	6,420,851	1.04	181	34,662	6,214
		Pole		25,959	9,213	1,745,885	.35	67	25,670	7,134
		Matura		9,377	4,457	1,064,702	.48	114	9,357	1,712
		Miscellaneous		4,900	2,230	596,499	.46	122	4,657	
		Stream (1)		5,039	16,098	3,626,108	3.19	720	5,039	
		Total		80,706	68,801	13,454,045	.85	167	79,385	15,060
	Sacond	Reproduction	1910-39	5,642	8,590	802,327	1.52	142	5,642	
		Pole		1,108	1,423	101,767	1.28	92	1,108	
		Mature		28	27	1,799	.96	64	28	
		Miscellaneous		33	34	1,503	1.03	46	33	
		Stream (2)		2,994	5,413	562,328	1.81	188	2,994	
		Total		9,805	15,487	1,470,234	1.58	150	9,805	
	Third and Other	Reproduction	1910-39	1,622	1,376	90,549	.85	56	1,622	
		Pole		125	149	7,256	1.19	58	125	
		Stream (3)		2,994	3,842	187,325	1.28	63	2,994	
		Total		4,741	5,367	285,130	1.13	60	4,741	
	All Workings	Reproduction	1910-39	42,695	46,769	7,314,227	1.10	171	42,126	
		Pole		27,192	10,785	1,854,908	.40	68	26,903	
		Matura		9,405	4,484	1,066,501	.48	113	9,385	
		Miscellaneous		4,933	2,264	598,002	.46	121	4,690	
		Stream (4)		11,027	25,353	4,375,831	2.30	397	11,027	
		Total		95,252	89,655	15,209,469	.94	160	94,131	
Kootenai	First	Plantation	1945-49	244	125	5,462	.51	22	244	
		Cutover	1945-49							80
		Cutover	1940-44							5,739
		Cutover	1920-39	1,164	759	50,937	.65	44	1,164	3,761
		Reproduction	1910-39	13,584	8,847	1,081,191	.65	80	12,850	9,937
		Pole		21,802	9,489	923,368	.44	43	20,890	22,217
		Mature		17,172	4,377	594,415	.25	35	16,167	16,529
		Miscellaneous		346	95	7,956	.27	23	346	
		Stream		3,712	11,802	1,486,199	3.18	400	3,484	
		Total		58,024	35,494	4,154,528	.61	72	55,145	58,263
	Second	Reproduction	1910-39	716	367	30,680	.51	43	716	
		Pole		1,143	1,113	55,118	.98	48	1,143	
		Stream		767	1,911	99,522	2.49	130	539	
		Total		2,626	3,396	185,320	1.29	71	2,398	
	Third	Pole		133	276	10,360	2.08	78	133	
		Stream		22	14	738	.64	34	22	
		Total		155	290	11,098	1.37	72	155	
	All Workings	Plantation	1945-49	244	125	5,462	.51	22	244	
		Cutover	1920-39	1,164	759	50,937	.65	44	1,164	
		Reproduction	1910-39	14,300	9,214	1,111,371	.64	78	13,566	
		Pole		23,078	10,883	993,846	.47	43	22,166	
		Mature		17,172	4,377	594,415	.25	35	16,167	
		Miscellaneous		346	95	7,956	.27	23	346	
		Stream		4,501	13,727	1,586,459	3.05	352	4,045	
		Total		60,805	39,130	4,350,946	.64	72	57,698	
All Forests	First	Plantation		244	125	5,462	.51	22	244	
		Cutover	1945-49							80
		Cutover	1940-44							5,739
		Cutover	1920-39	1,164	759	50,937	.65	44	1,164	3,761
		Reproduction	1910-39	49,015	45,650	7,502,042	.93	153	47,712	16,151
		Pole		47,761	18,702	2,674,253	.39	56	46,560	29,351
		Mature		26,549	8,834	1,659,117	.33	62	25,524	18,241
		Miscellaneous		5,246	2,325	604,455	.44	115	5,003	
		Stream (1)		8,751	27,900	5,112,307	3.19	584	8,523	
		Total		138,730	104,295	17,608,573	.75	127	134,730	73,323
	Second	Reproduction	1910-39	6,358	8,957	833,507	1.41	131	6,358	
		Pole		2,251	2,541	156,885	1.13	70	2,251	
		Mature		28	27	1,799	.96	64	28	
		Miscellaneous		33	34	1,503	1.03	46	33	
		Stream (2)		3,761	7,324	661,920	1.95	176	3,533	
		Total		12,431	18,883	1,655,614	1.52	133	12,203	
	Third and Othar	Reproduction	1910-39	1,622	1,376	90,549	.85	56	1,622	
		Pole		258	425	17,616	1.65	68	258	
		Stream (3)		3,016	3,856	188,063	1.28	62	3,016	
		Total		4,896	5,657	296,228	1.16	61	4,896	
	All Workings	Plantation	1945-49	244	125	5,462	.51	22	244	
		Cutover	1920-39	1,164	759	50,937	.65	44	1,164	
		Reproduction	1910-39	56,995	55,983	8,426,098	.98	148	55,692	
		Pole		50,270	21,668	2,848,754	.43	57	49,069	
		Matura		26,577	8,861	1,660,916	.33	62	25,552	
		Miscellaneous		5,279	2,359	605,958	.45	115	5,036	
		Stream (4)		15,528	39,080	5,962,290	2.52	384	15,072	
		Total		156,057	128,835	19,560,415	.83	125	151,829	

Chemical work included above:

	Acres	Man-Days	Gallons Spray
(1)	717	1,984	58,690
(2)	182	388	11,421
(3)	37	223	4,180
(4)	936	2,595	74,291

TABLE 7

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1928-1946
MONTANA OPERATION

Class	Gross Acres	Man-Days	Total Ribes	Gallons Spray	Per Acre Man-Days	Per Acre Ribes
EQ-Reg.	2,002	3,295	761,710	34,795	1.65	380
EQ-Emergency	66,076	30,787	5,775,415	1,330	.47	87
FS-Reg.	37,792	46,693	4,183,558	10,203	1.24	111
FS-Emergency	35,712	35,620	7,367,723	21,638	1.00	206
CCC	14,475	12,440	1,472,009	6,325	.86	102
Total	156,057	128,835	19,560,415	74,291	.83	125

TABLE 8

OWNERSHIP OF LAND COVERED ON RIBES ERADICATION, 1928-1946
MONTANA OPERATION

Forest	Ownership	Net Acres in Control Area: Acres Worked: First	Second	Third	Total	Acres Unworked	Total Acres
Cabinet	National Forest	62,976	7,801	2,901	73,678	11,050	74,026
	Public Domain	40			40		40
	Subtotal Federal	63,016	7,801	2,901	73,718		74,066
	State	734	1		735		734
	Private	15,835	2,003	1,840	19,678	4,010	19,845
	Subtotal Other	16,569	2,004	1,840	20,413		20,579
	Total	79,585	9,805	4,741	94,131	15,060	94,645
Kootenai	National Forest	51,985	2,027	155	54,167	47,245	99,230
	State					173	173
	Private	3,160	371		3,531	10,845	14,005
	Subtotal Other	3,160	371		3,531	11,018	14,178
	Total	55,145	2,398	155	57,698	58,263	113,408
All Forests	National Forest	114,961	9,828	3,056	127,845	58,295	173,256
	Public Domain	40			40		40
	Subtotal Federal	115,001	9,828	3,056	127,885	58,295	173,296
	State	734	1		735	173	907
	Private	18,995	2,374	1,840	23,209	14,855	33,850
	Subtotal Other	19,729	2,375	1,840	23,944	15,028	34,757
	Total	134,730	12,203	4,896	151,829	73,323	208,053

BLISTER RUST CONTROL, MOUNT RAINIER NATIONAL PARK, 1946

By

M. C. Riley, Operation Supervisor

No ribes eradication work for the control of white pine blister rust was conducted on Mount Rainier National Park during the 1946 field season. This was in accordance with the plan as contained in the 1944 annual report, which plan contemplates proper spacing of reworkings so that full crew-seasons will be employed rather than small crews for shorter periods of time.

Two checkers were employed. While neither one had performed any checking work previously, they were both experienced in ribes eradication work, compass reading, and pacing, and were familiar with the areas to be covered. Because the checking job was not started until mid-July, all of the White River area was not covered, although the most important portion of White River and all of the Longmire-Silver Forest area were given a regular four per cent check.

In the course of the work 21 miles of upland check strip and 9.7 miles of stream type check were run on the Longmire-Silver Forest area, and 36.4 miles of upland strip and .5 miles of stream type check strip were run at White River. All strips were plotted on maps with a scale of 4 inches to 1 mile, and from these maps it will be possible to confine the next ribes eradication work to the small, individual pieces of ground which still have ribes remaining.

Since no ribes eradication work was performed during the 1946 field season, no progress tables are included. Tables showing cumulative results of ribes eradication can be found in the 1945 annual report.

RECOMMENDATIONS

On the basis of checking work performed during 1946, it is estimated that a crew of 25 effective field men employed for a full three-month period will be needed for ribes eradication and canker elimination work during the 1947 field season.

Expenditures for calendar year 1946:

Item	National Park Service Regular BLR-5
Personal Services	$ 956.23
Travel & Transportation	156.56
Communication Service	1.70
Supplies & Materials	28.22
Total	$1,142.71

BLISTER RUST CONTROL, GLACIER NATIONAL PARK, 1946

By

M. C. Riley, Operation Supervisor

The blister rust control program for the 1946 field season was concerned entirely with first working on the Oldman Lake area located in unsurveyed sec. 29, T. 32 N., R. 14 W. Montana Meridian.

Work was conducted from one camp which had a maximum of 25 workers in the field with a seasonal average of 18 effective workers. Ribes eradication was started on July 17 and was discontinued on September 5. A complete camp unit was rented from the U. S. Forest Service and all supplies and equipment were transported by pack train from Two Medicine Ranger Station to the campsite.

Under authority of the Secretary of the Interior, the crew worked a 48-hour week. No time was lost because of fire fighting.

Several factors contributed to the poor record made by this camp. A late spring necessitated postponing the packing and building of the camp. This, combined with misunderstanding regarding employment ceilings and the low wage schedule first used, caused considerable delay in getting a crew assembled. The camp was more uncomfortable than necessary and this had a very direct bearing on the poor camp morale. No experienced camp superintendent was available. The man finally selected was given a week's training on a Forest Service operation but his lack of experience and ability was reflected in the poor management of the field work. An experienced assistant foreman was secured in August for the remainder of the season.

Ribes eradication was initiated in the protection zone on the east end of the area where the heaviest concentration of ribes occurs. Because of prevailing wind currents, these ribes constitute the greatest threat to the white pine stand. The work in this protection zone was not completed during the 1946 field season. Portions of the worked area were fairly easy to clean up but difficult working conditions were encountered along small seepages and an old snow slide area where concentrations of ribes were intermingled with heavy brush and windfalls.

BLISTER RUST INFECTION

Scouting for white pine blister rust in previous years had revealed infections on white pine on the Lake McDonald, Two Medicine and Park Headquarters control units, along McDonald Creek, Fern Creek and on the North Fork of the Flathead River outside of any control units. During the past field season a limited amount of scouting revealed, aside from areas previously listed, infected white pine on the Oldman Lake control area where ten cankers were found on nine trees, which represents approximately two per cent of the total trees examined. Outside of any designated control area, new pine infection centers were located at Logan Pass where 19.4 per cent of the trees examined were infected and at Paradise Creek where 13 per cent of the examined trees were infected.

CONTROL STATUS

A very small amount of regular check was conducted this past season and this was confined to the Oldman Lake area. Therefore, there are no data which indicate any change of the control status on areas as listed in the 1945 Annual Report. The ribes eradication on the Oldman Lake unit materially reduced the amount of live stem on the small acreage covered but because of the large numbers of ribes removed and the ground disturbance, this area will need at least two more workings. The portion of Oldman Lake area remaining to be worked should not entail so large a man-day per acre expenditure because there is considerable ribes-free acreage remaining and working conditions are not generally so severe where ribes do occur.

RECOMMENDATIONS

The 1945 Annual Report contains specific recommendations for work to be done on areas which had been worked up to that time. General inspection on these areas indicates that these recommendations still apply. Such a small amount of work was accomplished on the Oldman Lake area this season that for purposes of planning future workings it should still be considered as all needing initial work. Until the initial work is completed and the quality of that work is determined, it is not feasible to forecast the number and spacing of future workings.

The following recommendations and estimates for the 1947 field season are considered essential for the orderly progress of the work. Oldman Lake requires thirty effective field men for a complete two-month period. Two Medicine requires twenty effective field men for one month. East Glacier requires twenty effective field men for two months. One checker should be employed for the full field season. This is a larger program than was anticipated when the estimates contained in the 1945 report were made but is necessitated by the work at Oldman Lake falling behind schedule. It would appear feasible that the work at Two Medicine and East Glacier be worked by the same camp unit with a sufficient increase in workers to allow for a possible shortened season.

Checking work has fallen behind schedule during the past three years. There is sufficient checking work to be done to warrant the employment of a checker for the season and every effort should be made to meet this objective.

If it is desired to perform canker elimination in the Logan Pass infection, a crew can be made up from the eradication forces to perform this work.

RESULTS

The following tables show statements of expenditures, results of the 1946 field work and accumulative results for all work performed to date.

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
GLACIER NATIONAL PARK

Item	National Park Service Regular BLR-5
Personal Services	$10,177.44
Travel and Transportation	47.66
Communication Service	12.95
Rents	494.39
Other Structural Services	1,436.11
Supplies and Materials	305.33
Total	$12,473.88

TABLE 2

SUMMARY OF RIBES ERADICATION, 1946
GLACIER NATIONAL PARK

Area	Working	Eradication Type	Acres	Effective Man-Days	Ribes by Species: Ribes lacustre	Ribes by Species: Ribes viscosissimum	Total Ribes	Per Acre Basis: Man-Days	Per Acre Basis: Ribes
Oldman Lake	First	Reproduction	13	195	10,595	30	10,625	15.00	817
		Miscellaneous	74	440	30,713	58	30,771	5.95	416
		Stream	1	16	1,571		1,571	16.00	1,571
		All Types	88	651	42,879	88	42,967	7.40	488

TABLE 3

SUMMARY OF RIBES ERADICATION BY CLASSES OF CAMPS, 1939-1946
GLACIER NATIONAL PARK

Working	Class	Acres	Effective Man-Days	Total Ribes	Per Acre Basis: Man-Days	Per Acre Basis: Ribes
First	NP-Reg.	350	952	80,122	2.72	229
	NP-CCC	2,633	2,833	323,841	1.08	123
	NP-CPS	658	1,020	120,335	1.55	183
	Total	3,641	4,805	524,298	1.32	144
Second	NP-Reg.	731	763	122,606	1.04	168
	NP-CPS	1,471	684	57,016	.46	39
	Total	2,202	1,447	179,622	.66	82
Third	NP-CPS	647	581	36,805	.90	57
All Workings	NP-Reg.	1,081	1,715	202,728	1.59	188
	NP-CCC	2,633	2,833	323,841	1.08	123
	NP-CPS	2,776	2,285	214,156	.82	77
	Total	6,490	6,833	740,725	1.05	114

TABLE 4

SUMMARY OF RIBES ERADICATION, 1939-1946
GLACIER NATIONAL PARK

Area	Working	Eradication Type	Acres	Effective Man-Days	Ribes by Species: Ribes lacustre	Ribes viscosissimum	Ribes setosum	Ribes inerme	Total Ribes	Per Acre Basis: Man-Days	Ribes
Park Headquarters	First	Reproduction	358	204	9,869	6,472	15,666		32,007	.57	89
		Pole	284	122	13,428	15,364	8,967		37,759	.43	133
		Miscellaneous	39	119	9,411	21,340	8,353		39,104	3.05	1,003
		All Types	681	445	32,708	43,176	32,986		108,870	.65	160
	Second	Reproduction	230	47	2,877	581	562		4,020	.20	17
		Pole	350	102	387	964	566		1,917	.29	5
		Miscellaneous	39	52	13	973	67	2	1,055	1.33	27
		All Types	619	201	3,277	2,518	1,195	2	6,992	.32	11
	Third	Reproduction	134	70	446	143	161		750	.52	6
		Pole	127	190	1,716	3,535	903		6,154	1.50	48
		All Types	261	260	2,162	3,678	1,064		6,904	1.00	26
	All Workings	Reproduction	722	321	13,192	7,196	16,389		36,777	.44	51
		Pole	761	414	15,531	19,863	10,436		45,830	.54	60
		Miscellaneous	78	171	9,424	22,313	8,420	2	40,159	2.19	515
		All Types	1,561	906	38,147	49,372	35,245	2	122,766	.58	79
Two Medicine	First	Pole	593	645	40,145	2,705	1,723	8,646	53,219	1.09	90
		Miscellaneous	60	118	3,935	1,050	4,665	1,834	11,484	1.97	191
		Stream	54	480	30,429	438		12,592	43,459	8.89	805
		All Types	707	1,243	74,509	4,193	6,388	23,072	108,162	1.76	153
	Second	Pole	252	181	15,716	1,332	4,562	5,874	27,484	.72	109
		Miscellaneous	16	20	1,495	67		2,471	4,033	1.25	252
		Stream	32	156	46,233	14		25,259	71,506	4.88	2,235
		All Types	300	357	63,444	1,413	4,562	33,604	103,023	1.19	343
	Third	Stream	44	116	11,230	32		12,456	23,718	2.64	539
	All Workings	Pole	845	826	55,861	4,037	6,285	14,520	80,703	.98	96
		Miscellaneous	76	138	5,430	1,117	4,665	4,305	15,517	1.82	204
		Stream	130	752	87,892	484		50,307	138,683	5.78	1,067
		All Types	1,051	1,716	149,183	5,638	10,950	69,132	234,903	1.63	224
Lake McDonald	First	Mature	1,730	923	21,125	4,253	34,175		59,553	.53	34
		Stream	47	278	21,911	36	1,602		23,549	5.91	501
		All Types	1,777	1,201	43,036	4,289	35,777		83,102	.68	47
	Second	Mature	1,184	620	11,051	1,393	17,490		29,934	.52	25
		Stream	13	69	3,126	137	1,324		4,587	5.31	353
		All Types	1,197	689	14,177	1,530	18,814		34,521	.58	29
	Third	Mature	342	205	4,682	126	1,375		6,183	.60	18
	All Workings	Mature	3,256	1,748	36,858	5,772	53,040		95,670	.54	29
		Stream	60	347	25,037	173	2,926		28,136	5.78	469
		All Types	3,316	2,095	61,895	5,945	55,966		123,806	.63	37
East Glacier	First	Pole	367	1,005	44,305	14,739	11,042	65,936	136,022	2.74	371
		Stream	21	260	71	158		44,946	45,175	12.38	2,151
		All Types	388	1,265	44,376	14,897	11,042	110,882	181,197	3.26	467
	Second	Pole	86	200	21,816	2,492	9,507	1,271	35,086	2.33	408
	All Workings	Pole	453	1,205	66,121	17,231	20,549	67,207	171,108	2.66	378
		Stream	21	260	71	158		44,946	45,175	12.38	2,151
		All Types	474	1,465	66,192	17,389	20,549	112,153	216,283	3.09	456
Oldman Lake	First	Reproduction	13	195	10,595	30			10,625	15.00	817
		Miscellaneous	74	440	30,713	58			30,771	5.95	416
		Stream	1	16	1,571				1,571	16.00	1,571
		All Types	88	651	42,879	88			42,967	7.40	488
All Workings	First	Reproduction	371	399	20,464	6,502	15,666		42,632	1.08	115
		Pole	1,244	1,772	97,878	32,808	21,732	74,582	227,000	1.42	182
		Mature	1,730	923	21,125	4,253	34,175		59,553	.53	34
		Miscellaneous	173	677	44,059	22,448	13,018	1,834	81,359	3.91	470
		Stream	123	1,034	53,982	632	1,602	57,538	113,754	8.41	925
		All Types	3,641	4,805	237,508	66,643	86,193	133,954	524,298	1.32	144
	Second	Reproduction	230	47	2,877	581	562		4,020	.20	17
		Pole	688	483	37,919	4,788	14,635	7,145	64,487	.70	94
		Mature	1,184	620	11,051	1,393	17,490		29,934	.52	25
		Miscellaneous	55	72	1,508	1,040	67	2,473	5,088	1.31	93
		Stream	45	225	49,359	151	1,324	25,259	76,093	5.00	1,691
		All Types	2,202	1,447	102,714	7,953	34,078	34,877	179,622	.66	82
	Third	Reproduction	134	70	446	143	161		750	.52	6
		Pole	127	190	1,716	3,535	903		6,154	1.50	48
		Mature	342	205	4,682	126	1,375		6,183	.60	18
		Stream	44	116	11,230	32		12,456	23,718	2.64	539
		All Types	647	581	18,074	3,836	2,439	12,456	36,805	.90	57
	All Workings	Reproduction	735	516	23,787	7,226	16,389		47,402	.70	64
		Pole	2,059	2,445	137,513	41,131	37,270	81,727	297,641	1.19	145
		Mature	3,256	1,748	36,858	5,772	53,040		95,670	.54	29
		Miscellaneous	228	749	45,567	23,488	13,085	4,307	86,447	3.29	379
		Stream	212	1,375	114,571	815	2,926	95,253	213,565	6.49	1,007
		All Types	6,490	6,833	358,296	78,432	122,710	181,287	740,725	1.05	114

BLISTER RUST CONTROL, YELLOWSTONE NATIONAL PARK, 1946

By
M. C. Riley, Operation Supervisor
C. M. Chapman, Pathologist

Ribes eradication for the control of white pine blister rust in Yellowstone National Park consisted chiefly of initial work on the Mount Washburn area, although a small amount of work was also done on the Mammoth unit. Work started on June 17 and ended on September 4 and was performed by a maximum crew of 24 workers in the field, with a seasonal average of 15 men in the field. The crew was located at the Canyon Camp while working on Mount Washburn.

The work at Mammoth consisted of initial working on stream type in the protection zone on Glen Creek and second working in stream type in Clematis Gulch and in upland types principally on the south side of the pine area and protection zone. This second working was performed on areas where the initial work of 1945 was not of a satisfactory standard.

On the Mount Washburn unit first working was performed on the south end of the unit, and that portion of the area was worked from the south end of the protection area north to Dunraven Pass along the highway and to the west of the highway, and about one-quarter mile farther north on the east side of the area. Because of topography and prevailing wind currents, this section is considered as a vulnerable portion of the Mount Washburn unit.

A very satisfactory quality of work was performed. The almost continual change in personnel of individual crews made it impossible to develop the highly trained crew which functions best, especially in such extreme working conditions as are found in the rocky portion of the unit. As much as five man-days per acre were required on some parts, such as Dunraven Peak, while others were of such a nature that the average man-day requirements were well within reason. Considerable saving was effected by treating the crowns of decapitated rock-bound ribes with dry ammonium sulfamate.

In an effort to determine the effective dosage to be applied when using 2,4-Dichlorophenoxyacetic acid, commonly called 2,4-D, on *Ribes petiolare* as it occurs in Yellowstone National Park, test plots were established on Glen Creek. From these plots a satisfactory dosage can be determined after examination in the spring of 1947. This chemical is favored because of such factors as effectiveness, cost, transportation of chemical, and freedom from fire hazard and soil sterilization. Because the chemical is absorbed principally through the leaves rather than the roots, it is especially adaptable for use on ribes growing in streams and swamps, and these bushes have constituted a problem thus far in Yellowstone National Park.

Fire-fighting duties caused considerable interruption to the ribes eradication program. Approximately 18 per cent of the time when the crew was at top strength was spent on actual fire fighting, and the lost effectiveness is considerably higher when it is realized that this time is lost when crews are at their peak of efficiency and that it takes several days after such interruptions before the crew gets back to full production.

CHECKING, SURVEYS, AND SCOUTING

Very little regular check was performed. Enough frequent random inspections were made to indicate that a good quality of work was being done. Before any rework is planned, a complete 4 per cent check should be made. A few check strips were run on the southeast side of the Mammoth area to determine the work limits.

During the summer of 1945, representatives of the Director's Office, the Regional Office, local Park Service officials, and representatives of the Bureau of Entomology and Plant Quarantine inspected the Craig Pass area. It was decided that an intensive survey should be conducted to determine the location and amount of ribes on the area. This survey was made during the 1946 field season by a representative of the Bureau of Entomology and Plant Quarantine. Strips were run to give a 4 per cent sample and extended several miles east of a point one-half mile west of Isa Lake and included an area one-half mile wide on either side of the highway. During the course of the survey, a total of 48 miles of strip was run, and the resulting map shows the area needing ribes eradication. It is estimated that approximately only 400 acres would need working to protect a minimum of 3,000 acres of white pine.

During the course of the field season and after the ribes eradication work was completed, scouting of white pine and ribes was conducted to determine the spread of the rust. No blister rust infection was found on white pine on either control unit. Some five-needled pines were inspected outside of any control area, but no infection was found. Ribes infection was found again this year in the general vicinity of Mammoth. This was all outside of the control area on Glen Creek, Lava Creek, Slide Creek, Gardiner River, and Clematis Gulch above the protection zone, and near Gardiner, Montana. Determinations were made by the Division of Forest Pathology, U. S. Department of Agriculture, San Francisco, California. Ribes inspections were made at various other locations within the Park, but no other infection was found. These inspections were made at such widely distributed points as Mount Washburn, Craig Pass, West Thumb, Gibbon River, Norris Junction, Tower Falls, Grebe Lake, Lamar River, and Old Faithful. Since ribes infection was first discovered in Yellowstone National Park in 1944, increasing amounts have been found each year in the same general locations. This would indicate that there undoubtedly is white pine infection present in the immediate vicinity, and a more strenuous effort will be made next season to locate this center. It is evident that ribes eradication work on the Mammoth unit was started none too soon.

RECOMMENDATIONS

No ribes eradication work is anticipated on the Mammoth unit for the 1947 field season, with the possible exception of a few man-days on small isolated areas where seedlings may be a problem, and on one small patch of stream type where chemical may not have been properly applied.

For the Mount Washburn unit a 60-man field crew will be needed for the complete field season in order to complete the initial working.

If it is decided to protect the white pine on the Craig Pass unit, a crew of 30 field men would be required for a full month.

The proposed control area amounts to 8,778 acres, made up of the following units: Mammoth 1,578 acres; Mount Washburn 4,000 acres; Craig Pass 3,200 acres.

RESULTS

The following tables show statements of expenditures, results of the 1946 field work, and accumulative results of all work done to date:

TABLE 1

CLASSIFIED EXPENDITURES, CALENDAR YEAR 1946
YELLOWSTONE NATIONAL PARK

Item	National Park Service Regular BLR-5
Personal Services	$ 9,107.99
Travel & Transportation	377.62
Subsistence	749.93
Supplies & Materials	595.79
Total	$10,831.33

TABLE 2

SUMMARY OF RIBES ERADICATION, 1946
YELLOWSTONE NATIONAL PARK

Area	Working	Eradication Type	Acres	Effective Man-Days	Ribes by Species: Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes setosum	Ribes cereum	Ribes montigenum	Total Ribes	Gallons Sprey	Per Acre Basis: Man-Days	Ribes	Gallons
Mammoth	First	Stream	11	46			9,090				9,090	881	4.18	826	80
	Second	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	6	14			2,295				2,295	175	2.33	383	29
		All Types	152	67			2,295	3,478	621		6,394		.44	42	
	All Workings	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	17	60			11,385				11,385	1,056	3.53	670	62
		All Types	163	113			11,385	3,478	621		15,484		.69	95	
Mt. Washburn	First	Mature	436	655	5,430	1,075				72,211	78,716		1.50	181	
All Areas	First	Mature	436	655	5,430	1,075				72,211	78,716		1.50	181	
		Stream	11	46			9,090				9,090	881	4.18	826	80
		All Types	447	701	5,430	1,075	9,090			72,211	87,806		1.57	196	
	Second	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	6	14			2,295				2,295	175	2.33	383	29
		All Types	152	67			2,295	3,478	621		6,394		.44	42	
	All Workings	Mature	582	708	5,430	1,075		3,478	621	72,211	82,815		1.22	142	
		Stream	17	60			11,385				11,385	1,056	3.53	670	62
		All Types	599	768	5,430	1,075	11,385	3,478	621	72,211	94,200		1.28	157	

TABLE 3

SUMMARY OF RIBES ERADICATION, 1945 - 1946
YELLOWSTONE NATIONAL PARK

Area	Working	Eradication Type	Acres	Effective Man-Days	Ribes by Species: Ribes lacustre	Ribes viscosissimum	Ribes petiolare	Ribes setosum	Ribes cereum	Ribes montigenum	Total Ribes	Gallons Spray	Per Acre Basis: Man-Days	Ribes	Gallons
Mammoth	First	Mature	1,562	913	4,132	2,329		62,720	12,211		81,392		.58	52	
		Stream	16	125	4,190	2	18,990	281	4		23,467	1,646	7.81	1,467	103
		All Types	1,578	1,038	8,322	2,331	18,990	63,001	12,215		104,859		.66	66	
	Second	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	6	14			2,295				2,295	175	2.33	383	29
		All Types	152	67			2,295	3,478	621		6,394		.44	42	
	All Workings	Mature	1,708	966	4,132	2,329		66,198	12,832		85,491		.57	50	
		Stream	22	139	4,190	2	21,285	281	4		25,762	1,821	6.32	1,171	83
		All Types	1,730	1,105	8,322	2,331	21,285	66,479	12,836		111,253		.64	64	
Mt. Washburn	First	Mature	436	655	5,430	1,075				72,211	78,716		1.50	181	
All Areas	First	Mature	1,998	1,568	9,562	3,404		62,720	12,211	72,211	160,108		.78	80	
		Stream	16	125	4,190	2	18,990	281	4		23,467	1,646	7.81	1,467	103
		All Types	2,014	1,693	13,752	3,406	18,990	63,001	12,215	72,211	183,575		.84	91	
	Second	Mature	146	53				3,478	621		4,099		.36	28	
		Stream	6	14			2,295				2,295	175	2.33	383	29
		All Types	152	67			2,295	3,478	621		6,394		.44	42	
	All Workings	Mature	2,144	1,621	9,562	3,404		66,198	12,832	72,211	164,207		.76	77	
		Stream	22	139	4,190	2	21,285	281	4		25,762	1,821	6.32	1,171	83
		All Types	2,166	1,760	13,752	3,406	21,285	66,479	12,836	72,211	189,969		.81	88	

DEVELOPMENTAL WORK IN METHODS OF RIBES ERADICATION, AND PROGRESS OF RIBES ECOLOGY AND DISEASE CONTROL STUDIES IN THE NORTHWESTERN REGION FOR 1946

By
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R. T. Bingham, Agent; and H. R. Offord, Pathologist

FOREWORD

Activities of the developmental and improvement project BLR-1-6 for the calendar year of 1946 have included office, laboratory, greenhouse, and field work. The present annual report, as in past years, is primarily devoted to a discussion on field work. The material in this report is divided into three sections. Section I is a status report on the various field studies in methods of ribes eradication, problems of the ecology of ribes, and disease control investigations currently in progress. Section II is devoted to a discussion of these studies and the presentation of results. Section III is a report of laboratory and greenhouse activities and includes a listing of special reports and publications for the year 1946.

In section II, under Chemical Tests, are given the results of 1945 studies in the use of 2,4-dichlorophenoxyacetic acid as a herbicide, and a report on chemical investigations currently in progress. Recommendations are included for the practical field use of both 2,4-D and ammonium sulfamate (DuPont's Ammate). A progress report is presented on the studies of the ecology of ribes in relation to eradication control measures and timber management practices. Disease control investigations include a report on Hollywood Plot 9 by Stillinger. This is a study of damage from blister rust in a young stand of white pine reproduction. A brief summary of the Powder House Plot pruning study in the Clearwater National Forest also is presented.

A preliminary report of the establishment of a small *Ribes lacustre* bush study in the Coeur d'Alene National Forest is presented by R. T. Bingham. In addition, a brief report is made of a rust damage study to pole-sized western white pine in the St. Joe National Forest. Bingham was added to the Northwestern Region's Methods Project personnel in January of 1946 and will assist in the performance of ribes eradication studies, ecological investigations, and specialize in disease control problems having major importance to the ribes eradication program in the region.

I. SUMMARY

A. Tests of 2,4-Dichlorophenoxyacetic Acid for Ribes Eradication

1. Status of work. Field tests in 1945 of 2,4-D on *R. petiolare*, *R. inerme*, *R. lacustre*, and *R. viscosissimum* in Idaho were examined this season for effectiveness of kill. From the results dosages have been recommended for the practical field treatment of *R. petiolare*, the only species of high susceptibility to 2,4-D in the region. In Yellowstone National Park *R. montigenum* was found highly resistant to 2,4-D, but susceptible to ammonium sulfamate (DuPont's Ammate).

New compounds of 2,4-D in the form of sodium and ammonium salts, and the butyl ester liquid of 2,4-D were tested during the 1946 field season. A characteristic of this chemical, a plant growth hormone type of weed killer, is its high ecologic and plant species selectivity. Unfortunately, ribes species vary markedly in the degree of susceptibility to 2,4-D. As an illustration, R. petiolare is highly susceptible; R. viscosissimum moderately susceptible; and R. lacustre, R. inerme, and R. montigenum are moderately to highly resistant to 2,4-D. Field tests with this chemical were made this season in Idaho on R. viscosissimum and R. lacustre in the Kaniksu National Forest, and on R. petiolare and stream-type R. lacustre in the St. Joe National Forest. In Yellowstone National Park field studies were limited to the treatment of the single species R. petiolare.

Results from tests of 2,4-D on R. petiolare have been definitely satisfactory, and encouraging for R. viscosissimum seedlings if treatment is made before the development of much woody tissue characteristic of mature bushes. Likewise, there has been some evidence to indicate that 2,4-D is more effective on R. lacustre seedlings than on the mature bushes. From observations of this season's tests of 2,4-D on R. viscosissimum, definite plans are being formulated for large-scale practical field spray work in 1947 on cutover and burnt-over lands having an abundance of ribes seedlings. Treatment in all instances is expected to be confined to areas with a preponderance of R. viscosissimum seedlings (preferably those about two years of age).

Substances suitable as markers for 2,4-D spray solution were tested this season in California and in this region. The material Titanox B 30 was found the most satisfactory as a marker. Other types which have been tested mostly in California include Desert Whiting, Velvet White, Powdered Sulphur, and Weed-No-More Tracer, WP2621. Although some spreader has been added to the 2,4-D herbicides by their manufacturers, the amounts are not sufficient to give satisfactory wetting of the aerial plant parts of treated ribes. Tergitol No. 7 should continue to be added in the prescribed amounts to all spray solutions as a spreader, whether using 2,4-D or Ammate.

In addition to the use of the conventional knapsack chemical spray units for the establishment of test plots, a Buffalo Turbine Duster and Sprayer was experimentally employed to apply the butyl ester of 2,4-D in concentrated form. The acid equivalent strengths of the chemical for this study were 5,000 and 10,000 ppm. The test was established along the LaClerc Creek road in the Kaniksu National Forest. A 1939 cutover area was selected, having a preponderance of R. viscosissimum and a few R. lacustre bushes. The Buffalo Turbine Duster and Sprayer was borrowed from Pear Psylla Control in Spokane. Although designed for dust and spray work in orchards, good coverage of ribes was obtained with the chemical solution dispersed as a mist for distances of about one chain from the road. It required about 30 gallons to cover an acre, with actual spraying time amounting to about 25 minutes. As the nozzle is more or less stationary, difficulty was experienced in directing the spray solution to ribes locations. Redesigning of this machine or others on the market for spray work along forest roads has definite possibilities as an improvement in methods of control.

B. Ecological Studies of Ribes and Western White Pine

1. Status of work. Studies currently in progress on the ecology of ribes and western white pine are hereunder summarized. Time was largely devoted this season to timber sales work in coordinating cutting practices with the potential problems in the ecology of ribes. The major sale areas studied included Pass Creek in the Kaniksu National Forest, Steamboat Creek in the Coeur d'Alene National Forest, Fishhook Creek in the St. Joe National Forest, Martin Creek in the Cabinet National Forest, and the Sheep Mountain Sale in the Clearwater National Forest. Further investigations in direct seeding of western white pine were made this past season with the Forest Service.

   (a) Plots on the study of variable light and moisture conditions on germination, growth, and development of upland ribes and white pine seedlings were again inspected for new germination. This is the sixth consecutive season of inspection and reporting on this study. Established in the fall of 1940, three light stations were selected to represent variable environments under full sun, half shade, and full shade conditions. At each of these light stations seeds of ribes and white pine were sown on natural duff, mineral, and burnt-mineral soil surfaces. In this annual report, under section II, FIELD WORK, Table 11, is presented the complete record for seed germination upon the various soil surfaces at the three light stations. Previous and more detailed discussions are given in the 1940 to 1945 annual reports.

   (b) The study of longevity of ribes seeds after a logging disturbance was intensified during the current season. Interest in this study centers around the question of whether stored ribes seed undisturbed by logging or fire will continue to represent a potential population at some future date. One phase of the study involves the establishment of disturbance plots and the location of new disturbances caused by fire or relogging of previous cutover areas. The second phase involves the collection and screening of soil samples to recover stored ribes seed at various intervals of time succeeding the initial logging disturbance. This seed is then subjected to laboratory germination tests for the percentage of viability. Work on the latter project has been delayed until adequate laboratory facilities could be constructed in Spokane. The results of the disturbance plots in the field have been most encouraging. Any drastic change in the storage environment caused by opening the forest canopy will in turn affect ribes seed viability. The more drastic the change in soil temperature and soil moisture from the original cover conditions, the more pronounced the effect in the reduction of seed viability. The status of ribes seed germination from the data presented in the 1945 annual report remains unchanged.

   (c) Studies of slash disposal measures in relation to ribes control problems were continued in cooperation with the Forest Service, Potlatch Forests, Inc., and the Slash Disposal Committee of the Inland Empire Section, Society of American Foresters. Further

evidence was gathered to substantiate the fact that partial disposal of slash materially reduces the ribes regeneration problem on new cutover lands. Besides the reduction in numbers of ribes, their distribution is limited to roadways, skid trails, landings, and fire breaks. An advantage of this restricted distribution is that an excellent opportunity is afforded for chemical spray treatment.

(d) Studies of the ecology of ribes relating to silvical practices in the western white pine type were currently continued in cooperation with Timber Management and the Northern Rocky Mountain Forest and Range Experiment Station, Forest Service. This season, as in the past few years, practically all work has been directed toward the determination of ribes potentials on proposed sale areas. This information, with that contributed by associates specialized in entomological and silvicultural problems, has permitted the basic cooperation so essential to the selection of the most desirable forest practices for the white pine type. This cooperative effort to coordinate all forest problems with cutting practices is being extended to all timber sales of white pine in the region. The Fishhook Sales Inspection on the St. Joe National Forest, representing five major drainages, was the largest of many such projects inspected this past season. Besides the representation of interested federal agencies in this inspection, Mr. Wm. J. Luma, Assistant Forester for the Northern Pacific Railway Company, Land Department, was a welcomed member in the party.

(e) Further studies were made this season to evaluate and systematize procedures for predetermining the problems in potential ribes populations. The following procedure is outlined for acquiring this information.

(1) Examine control operation maps and observe the status of ribes populations recorded from areas adjoining the sale or forest unit. Make an on-the-ground examination of adjoining areas to determine the characteristics in the occurrence of ribes as along ridge tops, by various exposures, by age classes of timber stands, and whether ribes distribution is uniform or of a patchy pattern.

(2) Examine sale area for ribes. Most favorable habitats are moist sites, game trails, rodent mounds, upturns, rock outcrops, pack and road trails, and at junction of two timber types. Current and one-year-old seedlings can usually be found germinating upon rodent mounds and along game trails in the densest of timber stands.

(3) Study fire history of area in relation to exposure. Note whether stand originated following a single or multiple burn. Single burn on a south or west exposure is a general index of light ribes potential. Multiple burns on other exposures must be in evidence to give similar index of light ribes potentials.

The intensity of burn in all cases will determine the extent of the potential ribes population. Determine the intensity of burn by noting the degree coarseness of charred materials in the forest floor mantle. Whether a single or multiple burn can be ascertained from fire scars, age variations of individual trees in the stand, and occasionally by the zonation of charred materials in the organic mantle.

(4) Study silvical characteristics of stand such as density, composition, and age. Ribes potentials become lighter as age of stand increases and in the more open type of stand if parent bushes or remnants thereof are not in evidence. A high proportion of Douglas fir and/or larch in a stand is a good indication of light ribes association except along ridge tops. A high proportion of white pine usually denotes an association of ribes.

(5) Observe compatibility of associated vegetation with ribes. Species of brush compatible with ribes are Ceanothus sanguineus, elderberry, willow, alder, maple, fool's huckleberry, honeysuckle, dogwood, and in most cases thimbleberry. Species of brush more or less incompatible and denoting sparse ribes populations are ninebark, kinnikinnic, ocean spray, bush snowberry, and Pachistima and C. velutinus when the latter two represent a high proportion of ground cover.

(6) Examine soil profile to determine the favorableness of the storage environment for longevity of ribes seeds. A thick, compact organic mantle favors longevity, while a shallow or loose insulating mantle is unfavorable. Likewise, a deep and heavy textured soil favors seed viability, while a shallow and sandy soil does not.

(7) Time permitting, ribes seeds can be exposed for germination in advance of logging by disturbing the forest floor on a unit basis of area (one milacre). The simplest procedure is to remove the litter and duff layers and mix the humus with the top inch of mineral soil. Scatter a few of these milacre disturbance plots throughout the proposed sale area. The number in relation to the sale acreage is not too important, as the purpose is only to determine the relative range in ribes population and the approximate pattern of distribution. The disturbance procedure can be substituted by recovering ribes seeds in the collection of soil samples, screening through 20 and 30 mesh hardware cloth, processing to a small residue, identifying, counting, and subjecting seed to laboratory germination tests. The latter method of recovering ribes seed is not recommended unless laboratory facilities are available for germination tests.

(f) Tests in direct seeding of both white and ponderosa pine were established this season to further the investigation on spot and broadcast seeding of preconditioned seed planted in early spring. One series

of tests was made in the Kaniksu National Forest and the other in the Coeur d'Alene National Forest. The seed cracking machine referred to in the 1945 annual report was constructed during the latter part of the 1946 field season. This machine will be tested during the winter months and all necessary preparations made for large-scale seeding studies in 1947. If arrangements can be made, some seed will be pelleted for broadcast sowing. It is planned to prepare a special report covering progress of work in direct seeding since 1943. Serial Report No. 115, entitled "Preliminary Report on the Use of Germinated Seed as a Method of Reforestation for Western White Pine," was issued in 1943.

C. <u>Disease Control Plot Studies</u>

1. <u>Status of work</u>. As in previous years, blister rust disease behavior on ribes was observed by Stillinger in relation to the probable infection of western white pine throughout the region. Heavy infection on ribes, combined with ideal weather conditions in early September, may have been responsible for more pine infection than has occurred in any year since 1941. Field work for the season was largely confined to inspecting all pine in Hollywood Plot No. 9. The number of cankers on both alive and dead trees was tabulated as to the year of origin. The year in which a tree died from blister rust was likewise recorded. The objective of this study is to obtain information on the development and damage of blister rust in young stands of white pine reproduction becoming established on cutover lands in association with the small number of residual ribes from eradication. In this particular study the number of ribes and feet of live stem are being maintained at the approximate level of adjoining control area of three workings. In addition to work on the Hollywood plot, an examination was made of paired trees in the pruning study on the Powder House plot. It was found that 13 of a total of 36 pruned trees had died since the establishment of the study. Four of the 13 had apparently died from root rot, five from a combination of root rot and beetle attack, and four were killed outright by the bark beetle. Twelve additional live trees were found infested with the beetle. No serious winter injury or summer scald was observed on any of the pruned trees.

   A small <u>R. lacustre</u> bush study was established by Bingham in cooperation with the Forest Service in the Coeur d'Alene National Forest. The purpose of this study is to determine the infective potential of small ribes bushes residual after continued reworkings in relation to spread of the rust to white pine reproduction. A condensed discussion is presented of methods of study and climatological conditions for the area. Pine infection data and losses from blister rust during 1941 and later years are major topics in the report. The status of ribes after eradication work this season on the basis of a 20 per cent check is 32 bushes and 32 feet of live stem per acre. These are small bushes screened by surrounding vegetation. These ribes carry infection although a bush may have only three or four leaves. A brief report is included, covering the rust damage study to pole-sized white pine in the St. Joe National Forest.

II FIELD WORK

IMPROVEMENT OF CHEMICAL METHODS FOR RIBES ERADICATION

Results of 1945 Tests

Ammonium sulfamate in the form of DuPont's Ammate (80% by weight of ammonium sulfamate, $NH_4SO_3NH_2$) and 2,4-dichlorophenoxyacetic acid were tested in the field during 1945. The Ammate was tested on a practical basis, employing power equipment for broadcast spray treatment.

Tests of 2,4-D on stream type Ribes petiolare and R. inerme plots located along the St. Maries River above the Fernwood Bridge, St. Joe National Forest, were given a final check in September, 1946. The results are tabulated in Table 1. These tests represent a series of spring, summer, and fall treatments to determine the effectiveness of variable strength solutions of 2,4-D in relation to seasonal changes in plant development. A 100 per cent kill resulted in the treatment of R. petiolare in all except the fall series of plots. One bush remains alive in plot 18 and the ten treated with one-fourth strength chemical solution in plot 17. An interesting phenomenon occurred in the fall series of plots, regarding post-seasonal toxicity of 2,4-D. An inspection in June and again in July showed only minor kill of R. petiolare in these plots. Practically all the mortality in plots 18 and 19 took place during the period between the July inspection and the final check in September. Observations of this chemical at work will often be discouraging until one becomes familiar with its characteristically slow action. The important fundamental in the use of 2,4-D on susceptible species of ribes is obtaining thorough coverage of all aerial stems and leaves. The reason is because the growth hormone is not translocated laterally to any extent by the plant. The treatment of stream type R. inerme in the same chemical series gave negative results, except for kill of live stem. This species is one of two in the region moderately to highly resistant to the chemical.

A series of 2,4-D treatments applied to R. lacustre on cutover lands in the LaClerc Creek drainage, Kaniksu National Forest, likewise gave negative results. This species and R. inerme are the two which have strongly resisted all tests of 2,4-D. Of the two species, R. lacustre is considered the more highly resistant to the chemical hormone. The types of treatments and results of live stem kill for the series of tests on R. lacustre are shown in Table 2. Except for killing an occasional current live stem shoot, no permanent injury resulted from the treatment by 2,4-D acid.

Tests similar to those on R. lacustre were established in the LaClerc Creek drainage on R. viscosissimum. The results are shown in Table 3. These are not too encouraging, except for the evidence from the summer series of treatments that higher concentrations of 2,4-D may increase the effectiveness of the chemical on R. viscosissimum. As the majority of bushes treated were five years or older in age, there is the possibility that younger bushes of a seedling age might be more susceptible to the chemical. Both these points were investigated during the current season. A report thereon is presented in the section "Herbicides Tested in 1946."

The results of practical field tests in which Ammate was broadcast-sprayed with power equipment on the Coeur d'Alene National Forest are shown in Table 4. A discussion of equipment, methods, and chemical for this study was previously presented in the 1945 annual report. The percentage of bushes killed with the strengths of Ammate solution tested were highest for ribes in the small-bush class and decreased as size of bush became larger. As an example, 74.3% of *R. lacustre* bushes less than six inches in height were killed in plot 1, while the percentage kill decreased to 14.9% for bushes over 3.1 feet in height. Satisfactory results in the use of Ammate on *R. lacustre* cannot be obtained under one pound of chemical per gallon of water. The main objective of this study was accomplished in that the test demonstrated the practicability of using power equipment for broadcast spray treatment of cutover lands inhabited with small ribes bushes.

TABLE 1

RESULTS OF 1945 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON *R. PETIOLARE* AND *R. INERME*, FERNWOOD BRIDGE PLOTS, ST. JOE NATIONAL FOREST, IDAHO

Plot No. and Date Treated		Composition and Concentration of 2,4-D Solution	Gallons Solution	Per Cent Ground Occupied by Ribes	No. Bushes Treated	No. Bushes Dead	Per Cent Kill of Live Ste[m]
6/22	1	2,4-D 70% Dow Na Salt	4	90	9 P.	9 P.	100
		1.43 oz. in 10 gals. water			2 I.		60
	2	plus Tergitol #7	1	80	12 P.	12 P.	100
	3		3	20	4 P.	4 P.	100
					5 I.		60
	4		2	40	10 P.	10 P.	100
	5	2,4-D 60% Dow Na Salt	2	50	12 P.	12 P.	100
	6	1.67 oz. in 10 gals. water	1	70	14 P.	14 P.	100
	7	plus dilute NH_4OH to	4	75	5 P.	5 P.	100
	8	dissolve residue, plus Tergitol #7	3	90	6 P.	6 P.	100
8/3	9	2,4-D 100% acid in 1% Carbowax	2	40	8 P.	8 P.	100
	10	1.0 oz. in 10 gals. water	1	65	9 P.	9 P.	100
	11	plus Tergitol #7	4	50	10 P.	10 P.	100
	15		3	30	6 I.		80
	12	2,4-D 70% Dow Na Salt	1	40	8 P.	8 P.	100
	13	1.43 oz. in 10 gals. water	4	30	9 P.	9 P.	100
	14	plus Tergitol #7	2	60	10 P.	10 P.	100
	16		3	40	8 I.		80
9/12	17	2,4-D 60% Dow Na Salt	2 1/	70	10 P.		72
	18	1.67 oz. in 6 gals. water	2	80	8 P.	7 P.	99
	19	plus Tergitol #7	3	80	8 P.	8 P.	100
	20	2,4-D 60% Dow Na Salt	1	40	4 I.		8
	21	1.67 oz. in 6 gals. water	2	30	10 I.		23
	22	plus furfural (4 tablespoons) plus Tergitol #7	3	30	7 I.		33

1/ Same chemical but 1/4 strength.

TABLE 2

RESULTS OF 1945 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON *R. LACUSTRE*, LACLERC CREEK PLOTS, KANIKSU NATIONAL FOREST, IDAHO

Plot No. and Date Treated	Composition and Concentration of 2,4-D Solution	Gallons Solution	Per Cent Ground Occupied by Ribes	No. Bushes Treated	No. Bushes Dead	Per Cent Kill of Live Stem
6/13 1	2,4-D 100% acid in 1% Carbowax	2	75	9		
2	1.0 oz. in 10 gals. water	3	75	8		
3	plus Tergitol #7	1	85	15		
4a		4	50	6		
b			60	5		
6/15 5	2,4-D 70% Dow Na Salt 1.43 oz.	1	50	4		
6	in 10 gals. water plus	3	80	4		
7	Tergitol #7	4	85	4		.5
8		2	80	7		
8/9 17a	2,4-D 100% acid in 1% Carbowax	1	85	9		
18a	1.0 oz. in 10 gals. water	2	80	7		
19a	plus Tergitol #7	4	90	5		1.0
20a		3	90	4		.5
				2-V.		
21a	2,4-D 70% Dow Na Salt 1.43 oz.	3	95	5		2.0
22a	in 5 gals. water plus	2	85	6		1.0
	Tergitol #7					
9/10 26	2,4-D 60% Dow Na Salt 1.67 oz.	2 1/	35	6		
27	in 6 gals water plus	3	80	5		
28	furfural (4 tablespoons)	2	70	14		
	plus Tergitol #7					

1/ Same chemicals used but 1/4 strength.

TABLE 3

RESULTS OF 1945 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON *R. VISCOSISSIMUM* AND UPLAND *R. LACUSTRE*, LACLERC CREEK PLOTS, KANIKSU NATIONAL FOREST, IDAHO

Plot No. and Date Treated	Composition and Concentration of 2,4-D Solution	Gals. Solution	Per Cent Ground Occupied by Ribes	No. Bushes Alive: Before Treatment	No. Bushes Alive: After Treatment	Per Cent Kill: Bushes	Per Cent Kill: FLS
6/14 9	2,4-D 70% Dow Na Salt 1.43 oz. in 10 gals. water plus Tergitol #7[1]	4	35	8 V. 1 L.	8 V. 1 L.		3
10		3	50	34 V. 12 L.	34 V. 12 L.		2
11		1	35	9 V. 7 L.	9 V. 7 L.		
12		2	40	21 V. 2 L.	21 V. 2 L.		
13	2,4-D 60% Dow Na Salt 1.67 oz. in 10 gals. water plus dilute NH_4OH to dissolve residue plus Tergitol #7	3	30	13 V. 5 L.	13 V. 5 L.		1
14		4	40	14 V. 12 L.	13 V. 12 L.		2
15		2	25	25 V. 4 L.	25 V. 4 L.		
16		1	35	21 V.	21 V.		
8/10 17	2,4-D 70% Dow Na Salt 1.43 oz. in 5 gals. water plus Tergitol #7	3	40	30 V. 11 L.	16 V. 11 L.	46.7	68
18		2	45	32 V. 2 L.	19 V. 2 L.	40.7	53
19	2,4-D 100% acid in 1% Carbowax 1.0 oz. in 10 gals. water plus Tergitol #7	4	30	33 V.	17 V.	48.5	64
20		1	20	24 V. 2 L.	19 V. 2 L.	20.8	12
21		3	25	29 V. 1 L.	20 V. 1 L.	21.0	19
22		2	30	28 V.	23 V.	17.7	15
9/10 23	2,4-D 60% Dow Na Salt 1.67 oz. in 6 gals. water plus furfural (4 tablespoons) plus Tergitol #7	1	40	28 V.	28 V.		
24		2	40	24 V.	24 V.		1
25		3	50	31 V. 1 L.	31 V. 1 L.		4
25a		2[2]	30	36 V.	36 V.		

1/ In this and in all other tests Tergitol was used at the rate of about 1 tablespoonful for each 10 gallons of solution.
2/ Same chemicals used but 1/4 strength.

TABLE 4

RESULTS OF 1945 POWER BROADCAST SPRAY TESTS USING AMMATE ON R. LACUSTRE ON CUTOVER LANDS, COEUR D'ALENE NATIONAL FOREST, IDAHO

Plot No.	Bush Size in Feet	Per Acre: Alive Before Treatment: No. of Bushes	Per Acre: Alive Before Treatment: Feet of Live Stem	Per Acre: Alive After Treatment: No. of Bushes	Per Acre: Alive After Treatment: Feet of Live Stem 1/	Per Cent Kill: Bushes	Per Cent Kill: Live Stem
1	0- .5	857	293	220	39	74.3	86.7
4.75 Acres	.6-1.0	786	600	314	119	60.0	80.2
	1.1-2.0	678	981	411	249	39.4	74.6
(1/2 lb. Ammate	2.1-3.0	307	659	212	116	30.9	82.4
per gallon)	3.1+	485	2,516	413	979	14.8	61.1
	Total	3,113	5,049	1,570	1,502	49.6	70.3
2	0- .5	650	247	525	93	19.2	62.3
.45 Acres	.6-1.0	525	504	464	205	11.6	59.3
	1.1-2.0	175	338	162	123	7.4	63.6
(3/4 lb. Ammate	2.1-3.0	25	68	18	40	2.8	41.2
per gallon)	3.1+	525	2,415	518	1,945	1.3	19.5
	Total	1,900	3,572	1,687	2,406	11.21	32.6
3	0- .5	744	260	742	245	.3	5.8
.93 Acres	.6-1.0	686	468	685	450	.2	3.8
	1.1-2.0	510	715	510	700		2.1
(1/4 lb. Ammate	2.1-3.0	278	639	278	605		5.3
per gallon)	3.1+	492	1,820	492	1,790		1.6
	Total	2,710	3.902	2,707	3,790	.1	2.9

1/ Includes approximately 1/4 new growth from 1946 resprouts.

RECOMMENDATIONS ON THE USE OF AMMATE FOR PRACTICAL RIBES ERADICATION WORK IN THE NORTHWESTERN REGION

(Summarizes best information available through the fall of 1946)

Grade or type of chemical to purchase is DuPont's Ammate containing 80% by weight of ammonium sulfamate plus inert materials. This is a toxic chemical, rapidly killing upon contact with plant tissue. Low soil moisture and high soil temperature in mid-season tend to reduce the effectiveness of Ammate as a herbicide. Always stress the importance of good ground coverage for the roots and root-crowns of ribes.

1. Ribes fairly heavy and uniformly distributed. Chemical solution will be applied by knapsack or power sprayer on a unit basis of area.

Ribes Species	Dosage Per Milacre
R. lacustre (stream)	1 gallon
R. lacustre (upland)	1.5 gallons
R. petiolare	1 gallon
R. inerme	2 gallons
R. viscosissimum	2 gallons

Instructions: Dissolve chemical at the rate of 1.0 pound of Ammate per one gallon of water. Add Tergitol #7 at the rate of one tablespoon for each ten gallons of spray solution. In treating two or more ribes species in a single operation, use the heavier ribes dosage, providing the importance of this species is about equal to its associate. First, spray the central crown of a bush or the central portion of a clump, applying the spray vertically downward into the soil, and horizontally across the basal portion of the stems for clumps of ribes. This treatment should moisten the ground area shaded by the bush or clump. Next, spray upward along the stems of individual bushes and radially toward the outer edges of clumps, wetting all stems and turning the nozzle upward to moisten the under surface of the leaves. Finish with a top application, wetting all leaves and stems to the point of dripping.

2. Ribes fairly light and sparsely distributed. Chemical solution will be applied by knapsack or smaller spray unit to individual bushes.

Ribes Species	Pounds of Ammate Per Gallon of Water
R. lacustre (stream)	1.0 pound Ammate
R. lacustre (upland)	1.5 pounds Ammate
R. petiolare	1.0 pound Ammate
R. inerme	2.0 pounds Ammate
R. viscosissimum	2.0 pounds Ammate

Instructions: Dissolve chemical in the amount of Ammate per one gallon of water prescribed for each species of ribes. In treating two or more ribes species in a single operation, use the heavier amount of Ammate for a species in the association. Add Tergitol #7 at the rate of one-half tablespoon for three to five gallons of spray solution. First spray the root crown of the bush, directing the nozzle to two or three sides of the crown. The ground area around the base of the bush should be thoroughly moistened. Next, wet all stems and turn nozzle upward to moisten the under surface of the leaves. Finish with a top application, wetting all leaves and stems to the point of dripping.

RECOMMENDATIONS ON THE USE OF 2,4-D FOR PRACTICAL RIBES ERADICATION WORK IN THE NORTHWESTERN REGION

(Summarizes best information available through the fall of 1946)

The type of 2,4-Dichlorophenoxyacetic acid herbicide to purchase will be governed by price and the conditions of use. It is available as a powder and as a liquid concentrate. The triethanolamine liquid concentrate is at present the cheapest on a comparable basis of acid equivalent solution. The dry powder (e.g. sodium salt of 2,4-D) should be used where mixing of chemical solution is done in open tanks or in power sprayer tanks and where ribes numbers are fairly heavy, requiring the use of a considerable quantity of chemical solution. The liquid concentrate (either butyl ester, iso-propyl ester, or triethanolamine) is recommended for light ribes work where spraymen will be spending most of their work time in travel and search. The liquid concentrate can be mixed with water directly in the spray tanks.

2,4-D is a plant growth hormone type of herbicide, killing by slow systemic action, the precise nature of which has not been fully established. The action is slow; consequently, symptoms of injury, followed by death, are seldom noticeable until the second or third week after spraying. Twisted and accelerated growth of the terminal shoots of ribes is the first sign of reaction. Leaves gradually fade and wither, turning yellowish-brown upon death. The cambium layer in the root crown may remain yellowish-green throughout the season of treatment. The effectiveness of 2,4-D is at its best in early season when plant growth is rapid and succulent. For this reason, 2,4-D should not be used for late season work beyond the first of September after growth ceases, plant becomes woody, and new buds begin to swell. Because the plant does not translocate this hormone in lethal amounts from one stem to another, IT IS NECESSARY to apply chemical solution to each stem and all leaves thereon. To assure maximum absorption of 2,4-D by a plant, always treat the basal stems thoroughly down to the ground line and root crown.

<u>Always check to ascertain the percentage strength of 2,4-D contained in a powdered or liquid compound before selecting the amount of chemical prescribed for treating a ribes species from the recommendations.</u>

The amounts of chemical have been adjusted for the percentages of 2,4-D in the various compounds on a comparable basis of acid equivalent solutions. In mixing 2,4-D spray solution, first add Tergitol #7 to water, next add chemical, and add last the marker Titanox B30.

<u>Ribes petiolare</u>: This species is highly susceptible to all 2,4-D compounds hereunder recommended. Add one teaspoon of Tergitol #7 as a spreader for each ten gallons of spray solution. Next, add the amount of chemical given in ounces for ten gallons of water. This represents a chemical concentration of 0.08% or 800 parts per million of 2,4-D acid equivalent solution. First, apply soil drench to root portions of bush at the rate of one gallon of spray solution per milacre or until soil becomes thoroughly moistened around root crown. Next, work up stems and spray undersides of leaves. Finish with a top application, wetting all stems and leaves to the point of dripping.

Chemical Composition	Ounces of Chemical for Ten Gallons of Water
60% Sodium Salt of 2,4-D	1.78 ounces
70% Sodium Salt of 2,4-D	1.68 ounces
82% Sodium Salt of 2,4-D	1.43 ounces
83-1/3% Ammonium Salt of 2,4-D	1.38 ounces
40% Butyl Ester Liquid of 2,4-D	3.34 liquid ounces

For mixing chemical in amounts smaller than for ten gallons of spray solution, the 40% Butyl Ester Liquid Concentrate of 2,4-D is recommended. A graduate in 1/4-ounce divisions can be used for measuring the required amount of liquid concentrate for the spray solution. The measurements hereunder prescribed are for an acid equivalent solution of 0.08% or 800 parts per million of 2,4-D. This is the required chemical concentration for the treatment of R. petiolare in stream type. Tergitol #7 can be added at the rate of about 1/8-tablespoon for three to five gallons of spray solution.

Gallons of Water	2,4-D
3	1.00 ounce
4	1.34 ounces
5	1.67 ounces

Ribes viscosissimum: Present recommendations are for treating young seedlings which are more susceptible to 2,4-D than their moderately-susceptible parents. Treatment should be confined to areas having a preponderance of R. viscosissimum seedlings, and the majority of these two years in age. Add one teaspoon of Tergitol #7 as a spreader for each ten gallons of spray solution. Next, add the amount of chemical given in ounces for ten gallons of water. This represents a chemical concentration of 0.20% or 2,000 parts per million of 2,4-D acid equivalent solution. Last, add 2.7 ounces of Titanox B30 as a marker, for each ten gallons of spray solution. First, apply soil drench to root portions of bush at the rate of one gallon of spray solution per milacre, or until the soil becomes thoroughly moistened around root crown. Next, work up stems and spray undersides of leaves. Finish with a top application, wetting all stems and leaves to the point of dripping.

Chemical Composition	Ounces of Chemical for Ten Gallons of Water
60% Sodium Salt of 2,4-D	4.44 ounces
70% Sodium Salt of 2,4-D	4.19 ounces
82% Sodium Salt of 2,4-D	3.58 ounces
83-1/3% Ammonium Salt of 2,4-D	3.44 ounces
40% Butyl Ester Liquid of 2,4-D	8.36 liquid ounces

HERBICIDES TESTED IN 1946

Tests with the plant growth hormone type of weed killer, 2,4-dichlorophenoxyacetic acid, were intensified during 1946 with new compounds available. These included a 60% sodium salt of 2,4-D, an 83-1/3 ammonium salt, and a 40% butyl ester liquid concentrate of 2,4-D. The increased solubility of the salts of 2,4-D eliminates any difficulty previously experienced in dissolving the chemical in low temperature water. On a comparative basis of acid equivalent strengths, the salt compounds of 2,4-D are lower in costs than the liquid ester forms of the acid. The only advantage in using a liquid concentrate would be for knapsack chemical tank work where mixing of the spray solution is done directly in the spray tank to avoid the establishment of a tub mixing station. For power spray work, where mixing is mechanical, the salt compounds of 2,4-D will afford a considerable saving in chemical costs. Likewise, the dry powder form should be used for knapsack work in heavy ribes concentrations where spray tanks are filled from a tub mixing station.

Data presented in Tables 5 to 10 summarize the field tests made with 2,4-D on R. petiolare, R. viscosissimum, and R. lacustre during the 1946 field season. The only species in the region found definitely susceptible to 2,4-D has been R. petiolare. Ribes lacustre, R. inerme, and R. montigenum are in a class moderately to highly resistant to the chemical. Ribes viscosissimum is moderately susceptible to 2,4-D. The degree of susceptibility of R. viscosissimum to 2,4-D will undoubtedly vary with age of bush as indicated by this season's treatment of young seedlings. However, final proof as to the susceptibility of R. viscosissimum seedlings and also R. lacustre seedlings must await a check of these tests in 1947.

Table 5 shows a series of spray and soil drench tests of 2,4-D compounds on R. petiolare and R. lacustre. The chemical concentrations for the early season tests were varied from 50 to 500 parts per million, acid equivalent strengths of 2,4-D. For the mid-season tests the chemical concentration was increased by intervals of 100 with strengths varying from 200 to 500 ppm. Table 6 represents a test to determine the effectiveness of high chemical concentrations of 2,4-D on R. lacustre. In this series the parts per million of 2,4-D were varied from 1,000 to 4,000 for the treatment of old, mature bushes.

Table 7 is a series of tests on R. petiolare and R. lacustre, employing for plots "A" to "D" the butyl ester of 2,4-D in combination with a summer emulsion oil to serve as a spreader and penetrating agency. For plots "E" to "H" the test involved hot and cold water extracts from leaves, stems, and roots of each species with the addition of butyl ester at the rate of 1,000 ppm to one gallon of the extract. Not shown in the table were two direct absorption tests: One involved the immersion of a single R. lacustre branch in a solution of 500 ppm, A.E., butyl ester of 2,4-D; and the other, a single R. petiolare branch in the same strength solution. This test was established on June 27. To test the effectiveness of leaf and stem coverage only, a clump of R. petiolare in mid-stream, with roots entirely submerged in running water, was sprayed with 500 ppm, A.E. of the butyl ester of 2,4-D.

In Table 8 is shown a series of spray and soil drench tests with the butyl ester of 2,4-D applied to R. viscosissimum and R. lacustre seedlings under four years in age. Both early and mid-season treatments were established. Six plots were employed for each series of seasonal tests with the chemical concentration varying from 500 to 3,000 ppm. Treatment of seedlings before the development of dense, woody tissue characteristic of mature bushes, and while fast growing, may increase the susceptibility of these two ribes species to 2,4-D. This seems highly probable from observations of tests this season, in which it appears that a 100 per cent kill of R. viscosissimum seedlings will be attained and an encouraging high percentage kill of R. lacustre seedlings treated with 2,4-D concentrations above 1,000 ppm. As previously mentioned, final proof of the effectiveness of 2,4-D treatment of seedlings must await the 1947 field season.

Table 9 is a series of tests with the same age class of ribes seedlings as employed in the previous study. In this test the method of spray application, as well as the parts per million of 2,4-D, was varied. Seedlings in the "A" series of tests were treated by complete coverage of leaves and stems only, the amount of solution being controlled to prevent dripping onto the ground. A rose-type garden mist sprayer was used for the application of the chemical solution in this test. In the spray and soil drench tests, series "B" plots, the conventional knapsack unit was employed to thoroughly cover the aerial portions of the seedlings and apply a soil drench. Differences in the quantity of solution used for each treatment are shown in the table. The chemical concentration of 2,4-D was varied from 1,000 to 9,000 ppm.

Experimental chemical work in Yellowstone National Park, Wyoming, was limited this season to tests of 2,4-D on stream-type R. petiolare. The chemical treatments are shown in Table 10. For the June or early season series of tests, the chemical concentrations were made identical to those under trial in Idaho. An inspection of the June-treated plots in early July revealed that differences in growth characteristics of these high elevation bushes from the same species in Idaho necessitated increasing the chemical strength of 2,4-D in solution to secure symptoms of toxicity associated with ultimate kill. Thus, for the July series of treatments, the chemical concentration was raised to a minimum of 500 ppm and increased to a maximum of 2,000 ppm.

TABLE 5

1946 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON *R. PETIOLARE* AND *R. LACUSTRE*, MIDDLEFORK ST. MARIES RIVER PLOTS, ST. JOE NATIONAL FOREST, CLARKIA, IDAHO

Plot No. and Date Treated		Composition of 2,4-D	Per Milacre					
			Parts Per Million	R. petiolare		R. lacustre		Per Cent Ground Occupied by Ribes
				No. of Bushes	Feet of Live Stem	No. of Bushes	Feet of Live Stem	
6/5	1	60%	50	11	275	1	35	85
	2	Sodium	100	9	225	1	20	80
	3	Salt	200	6	325			95
	4		500	6	225			70
	5	83-1/3%	50	7	300			80
	6	Ammonium	100	4	450			85
	7	Salt	200	9	250			75
	8		500	8	325			90
	9	40%	50	6	285			85
	10	Butyl Ester	100	10	275	2	50	85
	11		200	8	250	1	15	75
	12		500	13	375	40		90
7/30	13	60%	200	1	140	4	35	60
	14	Sodium	300	5	125			60
	15	Salt	400	2	150			60
	16		500	1	200			70
	17	83-1/3%	200	3	165	1	70	75
	18	Ammonium	300	4	180	1	10	80
	19	Salt	400	7	160			60
	20		500	7	150			50
	21	40%	200	4	310			90
	22	Butyl Ester	300	8	190	3	70	65
	23		400	4	150	1	95	65
	24		500	4	180			80

TABLE 6

1946 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON *R. LACUSTRE*, MIDDLEFORK ST. MARIES RIVER PLOTS, ST. JOE NATIONAL FOREST, CLARKIA, IDAHO

Plot No. and Date Treated		Chemical Composition of 2,4-D Acid	Per Milacre			Per Cent Ground Occupied by Ribes
			Parts Per Million	R. Lacustre		
				No. of Bushes	Feet of Live Stem	
6/5	1	40%	1,000	9	300	75
	2	Butyl Ester	2,000	11	325	70
	3		3,000	8	350	80
	4		4,000	5	275	65

TABLE 7

1946 SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON *R. lacustre* AND *R. petiolare*, FILER CREEK, MIDDLEFORK ST. MARIES RIVER, ST. JOE NATIONAL FOREST, CLARKIA, IDAHO

Plot No. and Date Treated		Chemical1/	Gallons Per Milacre	Ribes Per Milacre		
				No. Bushes	Feet Live Stem	Per Cent Ground Occupied
6/27	A	100 cc. E 50 cc. O	1	10 L.	210	25
	B	50 cc. E 50 cc. O	1	15 L. 1 P.	150 15	25
	C	25 cc. E 50 cc. O	1	23 L.	250	35
	D	10 cc. E 50 cc. O	1	20 L.	250	35
	E	12 cc. E Hot extract *R. petiolare*2/	1	12 L.	500	80
	F	12 cc. E Cold extract *R. petiolare*	1	21 L.	300	60
	G	12 cc. E Hot extract *R. lacustre*	1	4 P.	500	100
	H	12 cc. E Cold extract *R. lacustre*	1	5 P.	400	80

1/ No spreader added to any of sprays. E = 40% butyl ester of 2,4-D. O = Volck Summer Emulsion Oil, heavy, as applied by the manufacturer.

2/ In plots E, F, G, and H, the butyl ester to make about 1,000 p.p.m. A.E. was added to one gallon of a previously prepared hot or cold water extract of leaves, stems, and roots of *R. petiolare* or *R. lacustre*.

TABLE 8

1946 SPRAY AND SOIL DRENCH TESTS WITH 40% BUTYL ESTER OF 2,4-D APPLIED AT THE RATE OF ONE GALLON PER MILACRE ON R. VISCOSISSIMUM AND R. LACUSTRE SEEDLINGS, HENDRICK'S BURN, LOWER WEST BRANCH OF PRIEST RIVER, KANIKSU NATIONAL FOREST, IDAHO

Plot No. and Date Treated		Per Milacre					
		Parts Per Million	R. viscosissimum		R. lacustre		Per Cent Ground Occupied by Ribes
			No. Bushes	Feet of Live Stem	No. Bushes	Feet of Live Stem	
6/12	1	500	18	21			20
	2	750	16	19			18
	3	1,000	18	35			20
	4	1,500	16	24	4	2	23
	5	2,000	13	28	1	1	20
	6	3,000	17	31	1	1	25
8/6	7	500	13	30			20
	8	750	16	38			25
	9	1,000	14	30	3	5	25
	10	1,500	17	45			30
	11	2,000	27	75			40
	12	3,000	19	60	1	10	35

TABLE 9

1946 AERIAL SPRAY VERSUS AERIAL SPRAY AND SOIL DRENCH TESTS OF 2,4-D ON R. VISCOSISSIMUM AND R. LACUSTRE SEEDLINGS HENDRICK'S BURN, LOWER WEST BRANCH OF PRIEST RIVER KANIKSU NATIONAL FOREST, IDAHO

Plot No. and Date Treated	Type of Application	Acid Equivalent PPM	Pints of Solution	Ribes Species	No. Bushes	Feet Live Stem
8/7 1-A	Spray	1,000	2.0	R. vis. R. lac.	25 5	37.5 4.3
1-B	Spray and soil drench	1,000	11.5	R. vis. R. lac.	25 5	31.0 3.9
2-A	Spray	3,000	2.5	R. vis. R. lac.	25 5	28.5 4.7
2-B	Spray and soil drench	3,000	13.0	R. vis. R. lac.	25 5	33.7 4.5
3-A	Spray	5,000	3.0	R. vis. R. lac.	25 5	29.3 3.5
3-B	Spray and soil drench	5,000	12.5	R. vis. R. lac.	25 5	23.8 3.8
4-A	Spray	7,000	2.5	R. vis. R. lac.	25 5	26.0 4.2
4-B	Spray and soil drench	7,000	13.0	R. vis. R. lac.	25 5	34.7 6.3
5-A	Spray	9,000	3.5	R. vis. R. lac.	25 5	39.5 5.8
5-B	Spray and soil drench	9,000	13.5	R. vis. R. lac.	25 5	43.5 5.5

TABLE 10

1946 SPRAY AND SOIL DRENCH TESTS WITH BUTYL ESTER OF 2,4-D ON *R. PETIOLARE*, GLEN CREEK, YELLOWSTONE NATIONAL PARK, MAMMOTH HOT SPRINGS, WYOMING

Plot No. and Date Treated	Chemical Concentration and Spray Dosage		Ribes Per Milacre		
	Parts Per Million	Gallons of Solution	No. Bushes	Feet Live Stem	Per Cent Ground Occupied
6/20 1	50	1	5	252	73
2	100	1	7	169	50
3	200	1	6	47	15
4	300	1	7	60	12
5	500	1	3	34	12
6	700	1	7	64	14
7	50	2	8	35	7
8	100	2	8	96	19
9	200	2	9	135	24
10	300	2	4	96	23
11	500	2	4	33	5
12	700	2	12	119	20
7/22 13	500	1	7	29	9
14	750	1	8	22	9
15	1,000	1	3	6	7
16	1,250	1	7	31	14
17	1,500	1	6	196	45
18	2,000	1	8	258	41

The Effects of Variable Light and Moisture Conditions on the Germination, Growth, and Development of Ribes lacustre, R. viscosissimum, and Pinus monticola

Established in 1940, the major objective of this study was accomplished upon termination of the 1945 field season. Its purpose was to determine the comparative influence of environmental factors upon germination, survival, and growth of the region's two principal upland ribes species with western white pine under full sun, half shade, and full shade conditions. Seeds of ribes and white pine were sown at each of these light stations on natural duff, mineral, and burnt-mineral soil surfaces. Since the 1945 field season, attention has been directed toward observing each year's germination and to recover seeds at various intervals from the date of sowing for germination tests on viability under laboratory conditions. Previous discussions of this study are given in the Northwestern Region's annual reports 1940 to 1945.

Table 1, as in past years, shows the number of ribes and white pine seeds germinating by seasons, the total number of seed germinating, and the per cent of total seed sown germinating during the six years. Ribes seeds were sown in 1940 at the rate of 800 per square foot, representing 3,200 per sub-plot and totaling 16,000 for each plot or soil surface. White pine seed was sown at the rate of 100 per square foot, representing 400 per sub-plot and totaling 2,000 per plot or soil surface.

Ribes seeds have continued to germinate only under conditions of full shade. Of the two species, R. lacustre seed has germinated in significantly higher numbers under all environmental conditions throughout the six years of observations. The length of time ribes seeds will continue to germinate is definitely related to environment. Ribes seeds which were recovered by a screening process at the end of the 1945 field season are being tested for viability under laboratory conditions.

TABLE 1

NUMBER OF RIBES AND WHITE PINE SEED GERMINATING DURING THE SEASONS 1941, 1942, 1943, 1944, 1945 AND 1946; TOTAL SEED GERMINATING DURING THIS PERIOD AND PER CENT OF TOTAL SEED SOWN GERMINATING

Soil Surface	Plant Species	Light Intensity	Number Seeds Germinating by Seasons						Total Seed Germ.	% of Total Seed Sown Germ.
			1941	1942	1943	1944	1945	1946		
Duff	R. lac.	Full Sun	15	674	19	0	0	0	708	4.425
		Half Shade	42	1,348	239	12	0	0	1,641	10.26
		Full Shade	771	5,968	479	297	193	108	7,816	48.85
	R.visc.	Full Sun	16	2	0	0	0	0	18	.11
		Half Shade	54	1	0	0	0	0	55	.34
		Full Shade	288	0	68	15	9	2	382	2.39
	Western White Pine	Full Sun	20	6	0	0	0	0	26	1.30
		Half Shade	49	90	5	0	0	0	144	7.20
		Full Shade	841	212	37	0	0	0	1,090	54.50
Mineral	R. lac.	Full Sun	3,184	2,134	57	0	0	0	5,375	33.59
		Half Shade	2,725	6,078	367	16	0	0	9,186	57.41
		Full Shade	1,937	6,191	1,992	365	186	94	10,765	67.28
	R.visc.	Full Sun	1,322	7	0	0	0	0	1,329	8.31
		Half Shade	1,092	11	0	0	0	0	1,103	6.89
		Full Shade	1,083	0	3	18	7	3	1,114	6.96
	Western White Pine	Full Sun	883	14	0	0	0	0	897	44.85
		Half Shade	1,170	29	11	0	0	0	1,210	60.50
		Full Shade	1,434	44	21	0	0	0	1,499	74.95
Burnt-Mineral	R. lac.	Full Sun	1,966	5,967	23	0	0	0	7,956	49.72
		Half Shade	2,650	8,493	437	7	0	0	11,587	72.42
		Full Shade	2,233	6,326	1,183	52	39	21	9,854	61.59
	R.visc.	Full Sun	740	13	0	0	0	0	753	4.71
		Half Shade	1,556	19	0	0	0	0	1,575	9.84
		Full Shade	1,554	0	44	7	2	0	1,607	10.04
	Western White Pine	Full Sun	314	1	0	0	0	0	315	15.75
		Half Shade	1,200	39	7	0	0	0	1,246	62.30
		Full Shade	1,379	49	13	0	0	0	1,441	72.05

DISEASE CONTROL PLOT STUDIES

Infection Conditions During 1946

Weather conditions were favorable for the development of the rust on ribes during the summer of 1946. All plots showed an increase in the amount of rust present on ribes in late August over that present in previous years. Early September was especially favorable for pine infection. During the period September 2 to September 7, temperature and humidity conditions were continuously near optimum for pine infection. With ribes infection heavy and weather conditions favorable during this entire period, considerable pine infection may have occurred.

Results from Hollywood Plot 9

Most of the field work during the summer season of 1946 consisted of a thorough inspection of the pine on Hollywood Plot 9. This plot, established in 1938, is located in the southeast quarter of sec. 17, T. 37 N., R. 5 E., in the Clearwater National Forest. The plot is square, 4 chains on the side, or 1.6 acres. In 1939 the size was increased to 8 chains on the side, or 6.4 acres. Initial ribes eradication was performed in 1933, prior to logging. The timber was cut in 1934, leaving a small residue of suppressed pole-sized timber. Drastic opening of the stand has allowed an abundance of nearly pure white pine reproduction to develop. Their numbers vary from 60 to 1000 trees per square chain.

During the course of the study, an effort was made to locate and keep a record of all ribes germinating on the area and all infection of pine. All ribes have been inspected each year for the presence of white pine blister rust, with the amount estimated in square inches of infected leaf surface.

Ribes History. A summary of the history of the 335 ribes on the area is shown in Table 1. The column, "Ribes Found, New," represents the years in which particular ribes were found. These data do not have any relation to the age of the ribes since a careful check for bushes was not made each year. They do, however, show the difficulty of finding all ribes in any one year. This table shows that 37 ribes, or 11 per cent of the total number of bushes, have died to date. Also, 257, or 76.72 per cent, of the ribes were eradicated in order to maintain a definite number of bushes per acre on the plot. The last column tabulates the number of ribes left on the plot each year. These are the ones responsible for most of the infection developing each season.

Germination of Ribes. In order to obtain some information regarding the germination of ribes on the plot, the probable years of germination for part of the ribes are shown in Table 2. These data are available for about half the bushes, due to the fact that information was not taken for bushes eradicated early in the history of the plot, and because of the inability to determine year of origin accurately in several cases. From this table it is evident that the peak of germination was reached in the period 1935 to 1937. Occasional ribes have continued to germinate since 1937. All are *Ribes viscosissimum*.

Disease on Ribes. Annual plot inspections have been made during the latter part of August, the period when the rust is approaching maximum development. These

results are summarized in Tables 3 and 4, and show the amount of live stem found, the amount of live stem left, the amount of rust in square inches of leaf surface, and the amount of rust per foot of live stem. With reference to Table 3, it is noted that since 1942 an effort has been made to maintain live stem at a constant figure of approximately 60 feet for the plot, or an average of about 10 feet per acre. This has been accomplished by eradicating some of the bushes and pruning back others having an excessive amount of live stem. The height of bushes has been kept under one foot.

From Table 4, it is evident that the per cent of bushes infected has gradually increased since 1940. With few exceptions, the amount of rust per foot of live stem has also gradually increased. The greatest amount of infection, expressed in the per cent of bushes infected, the amount of rust per bush, and the amount per foot of live stem, developed in 1946.

Comparing the number of bushes left each year in Table 2, the feet of live stem in Table 3, and the per cent of bushes infected in Table 4 with the total amount of infection present and the amount per foot of live stem, there appears to be no correlation.

White Pine Infection. All the pine reproduction on the plot was inspected for blister rust infection in 1946. The only other year was 1940, in which all pine was inspected and showed 2.93 per cent of the trees infected.

TABLE 1

HISTORY OF RIBES BUSHES FOUND ON HOLLYWOOD PLOT 9 FROM 1938 TO 1946

Year	Ribes Found		Disposition of the Ribes Found		
	Total	New	Dead	Eradicated	Left
1938*	61	61	0	0	61
1939	229	168	1	144	84
1940	143	59	2	74	67
1941	76	9	5	1	70
1942	79	9	12	8	59
1943	68	9	3	6	59
1944	63	4	4	0	59
1945	61	2	8	2	51
1946	65	14	2	22	41
Total		335	37	257	

*Plot consisted of 1.6 acres in 1938, but was increased to 6.4 acres in 1939.

TABLE 2

AGE OF BUSHES

	Probable Year of Germination													
	1926	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	Total
No. of Bushes	1	1	2	10	34	40	31	13	8	4	2	1	4	151

TABLE 3

HISTORY OF RIBES INFECTION FOR PERIOD 1938 - 1946 FOR HOLLYWOOD PLOT 9

	Feet of Live Stem		Ribes Infected						Square Inches of Infection	
			Found			Left				
Year	Found	Left	No. Inf.	Not Inf.	No Data	No. Inf.	Not Inf.	No Data	Found	Left
1938*	141' 7"	140' 6"	45	7	9	45	7	9	No Data**	
1939	628' 0"	306'10"	65	19	145	65	19	-	No Data	
1940	475' 2"	187' 7"	74	61	8	24	41	2	304.45	190.92
1941	219' 0"	219' 0"	32	37	7	32	37	1	94.12	94.12
1942	252'10"	62' 5"	35	28	16	27	27	5	94.37	19.89
1943	100' 9"	59' 7"	44	19	5	41	16	2	39.28	21.88
1944	62' 6"	62' 6"	55	3	5	55	3	1	72.42	72.42
1945	75' 2"	73' 6"	42	10	9	40	10	1	61.22	57.60
1946	88' 3"	61' 1"	60	-	5	41	-	-	106.19	72.43

* Plot consisted of 1.6 acres in 1938, but was increased to 6.4 acres in succeeding years.

**Infection recorded only as light, medium, or heavy in 1938 and 1939.

TABLE 4

INFECTION ANALYSIS PER BUSH AND PER FOOT OF LIVE STEM BY YEARS

	Per Cent Ribes Infected		Square Inches of Infection			
			Per Bush		Per Foot of Live Stem	
Year	Found	Left	Found	Left	Found	Left
1938	86.54	86.54	?	?	?	?
1939	77.38	77.38	?	?	?	?
1940	54.81	36.92	2.26	2.94	.641	1.016
1941	46.38	46.38	1.36	1.36	.430	.430
1942	55.56	50.00	1.50	.37	.373	.319
1943	69.84	71.53	.62	.38	.390	.367
1944	94.82	94.82	1.16	1.16	1.159	1.159
1945	80.76	80.00	1.18	1.15	.814	.784
1946	100.00	100.00	1.77	1.77	1.203	1.186

Analysis of Pine Infection

Since this is one of the first plots established for which fairly complete records have been kept, the data have revealed considerable information regarding the progress of infection in young stands of white pine reproduction.

All trees infected have been tagged and the infection data recorded, making it possible to keep a fairly accurate record of the development of the rust on each pine. After the infected trees began to die, each was removed, and the record completed. Considering all trees which have died from blister rust and those infected but still alive, the approximate average per cent of the infection for the plot is 30.67. This is an increase of about ten times the infection found in 1940, largely due to the 1941 wave of infection. Considering only the living trees, the infection is 20.50 per cent. This latter percentage is approximately the same for all the area within the section surrounding the plot. The considerable difference in these two percentages is due to the trees which have died from the rust. A large number of these dead trees would not have been found or their existence known if careful records had not been kept of all infection found during previous inspections. From the practical viewpoint, this difference emphasizes the necessity of a careful canker analysis with reference to disease surveys to determine whether any change in the per cent of infection is due to balancing of new infection by the loss in death of infected trees. Using the per cent infection alone may lead to an erroneous interpretation of the results if many dead trees are missed on disease survey.

Detailed Analysis of Chain 15, Strip 1

To obtain information regarding the action of the disease on the plot, an analysis was made in detail of a small sub-plot (chain 15, strip 1) of the main plot.

Canker Analysis. To determine the years when infection took place, the cankers were tabulated according to the year of wood infected. Table 5 gives such an analysis for the sub-plot.

TABLE 5

SUMMARY OF CANKERS FOUND IN 1946 BY YEARS OF WOOD INFECTED

	Year Wood									
	1943	1942	1941	1940	1939	1938	1937	1936	1934	Total
Cankers	2	7	59	226	418	220	53	41	1	1,027

An interpretation of this canker pattern reveals that infection took place in 1937, 1940, and 1941, with light infection in 1943. Data from other parts of the plot showed that the infection recorded as 1943 was really from a small 1944 wave. A previous study of incomplete data showed the 1940 wave to be masked by infection occurring in 1941. However, complete data indicate very definitely that both 1940 and 1941 were favorable years for infection in this

area. Because of the close association of these two waves of infection, it is impossible to separate them in the following tabulations.

This canker analysis indicates that the young pine were first infected in 1937. Little aecial production from these young pine occurred until 1940, with the peak reached in 1941. The probability of a heavy liberation of aeciospores in 1940 is reflected in the considerable amount of rust per bush shown in Table 4. Also to be noted under the per cent of bushes infected in Table 4 is a decrease in the per cent of bushes infected, indicating a very localized spread of the rust from ribes to the pine. Ribes were quite small, averaging about two and one-half feet of live stem per bush.

Although the young pine were infected first in 1937, an examination of several of the trees in the overstory revealed infection of 1927 and 1933 origin. Some of these old cankers were still fruiting in 1943. Although most of the large trees were removed in 1934, enough were left with blister rust to thoroughly infect the ribes as they germinated. This probably accounts for the higher percentage of bushes infected in 1938 and 1939 shown in Table 4, as well as the general distribution of infection originating in 1937.

Distribution of Infection by Infected Trees. In order to learn how the disease is distributed among the pine for each of the infection years, all trees were classified according to the years infected or reinfected. The results are given in Table 6. Infected trees are also separated as to whether alive or dead.

TABLE 6

YEARS WHEN DISEASED TREES WERE INFECTED

Infection Years	Alive	Dead	Total
1941	109	181	290
1937	4	45	49
1941-37	12	22	34
1944-41	3	1	4
1944-41-37	1	-	1
Total	129	249	378
Per Cent	34.12	65.88	100.00

From this table, the lack of repeated infections on the same trees is quite evident, even though the source of infection was practically the same. Also, the heavy intensification which takes place once the rust is established, is evident by comparing the number of trees infected in 1937 with those infected in 1941. This tabulation shows no new trees infected by the 1944 wave, but some were found on other parts of the plot. Although nearly two-thirds of the trees infected in 1937 and 1941 have died, it is of interest to note that one-third of the trees infected in 1937 are still alive nine years after becoming infected. Although all of the infected trees will eventually die, it is surprising how long they will live before succumbing to the attack. Much of the killing is due to a combination of blister rust, parasitism, and gnawing by squirrels.

Reduction in Number of Cankers Due to Death of Trees. In order to determine the reduction in the number of cankers due to the death of parts of the tree, the number of cankers on both dead and alive infected trees was compiled according to the probable year of canker origin. The results are given in Table 7.

TABLE 7

DECREASE IN NUMBER OF LIVING CANKERS
DUE TO DEATH OF TREES

Tree Status	Number of Cankers by Probable Year of Origin			Total	Per Cent
	1944	1941-1940	1937		
Alive	8	433	26	467	45.47
Dead	1	489	70	560	54.63
Total	9	922	96	1,027	100.00

These data reveal that although 65.88 per cent of the trees have died, their death has eliminated only 54.63 per cent of the cankers. This is somewhat the opposite of what might be expected, as it is generally supposed that trees with the most cankers will die first.

Rate of Death. During the last three years, all dead trees have been removed and a record made of the probable year of death. Since the first year of this work, it has been possible to record tree death by almost exact years. For the years previous to the first removals, the year of death was determined as nearly as possible. Table 8 gives a summary of these results.

TABLE 8

YEARLY RATE OF DEATH OF INFECTED TREES

Year Infected	Year of Death							Total
	1946	1945	1944	1943	1942	1941	1940	
1941-1940	60	21	13	77	7	1	-	179
1937	2	2	3	21	30	4	2	64
Total	62	23	16	98	37	5	2	243*
Cumulative Total	243	181	158	142	44	7	2	
Cumulative Percentage	65.32	48.66	42.47	38.17	11.82	1.88	.54	

* Excludes data on six trees probably dead before 1940.

The general trend of the data indicates that more than ten years will be necessary before all the infected trees in the young reproduction stand will be killed.

Increase in Height-Growth After Infection

Though a tree may be fatally infected, it appears to grow at about the same rate as its uninfected neighbor. This rate of growth may continue until the foliage begins to fade and the tree is near death. In examining dead trees, an effort was made to determine the height of the tree when infected and the height at death. Although it was not possible to obtain this information for all dead trees, it was secured quite accurately for the majority. The data are divided into two parts--trees infected in 1940 and 1941, and trees infected in 1937. In each of the parts of the table, the trees are grouped according to the year of death. The heights for each group of trees when infected and when dead are totaled. From these data an average height figure is derived. The heights are quite variable, hence the average must be considered only as an indication of the probable actual heights. These data are tabulated in Table 9. (Although the basis is small, the results do show an interesting trend in most cases.)

TABLE 9

INCREASES IN HEIGHT AFTER INFECTION

	1946		1945		1944		1943		1942		Total	
	WI*	WD*	WI	WD	WI	WD	WI	WD	WI	WD	WI	WD
TREES INFECTED IN 1937												
No. Trees	2		2		3		18		19		44	
Sums Hts. Inches	44	91	16	65	36	102	220	560	168	412	484	1230
Ave. Ht.	22.0	45.5	8.0	32.5	12.0	34.0	12.2	31.1	8.2	21.7	11.0	27.9
Per Cent Increase in Ht.	206.82		406.25		283.33		254.58		245.24		254.05	
TREES INFECTED IN 1940 AND 1941												
No. Trees	60		17		10		58		6		151	
Sums Hts. Inches	821	1836	197	485	130	235	717	1532	66	84	1931	4172
Ave. Ht.	13.7	30.6	11.6	28.5	13.0	23.5	12.4	26.4	11.0	14.0	12.8	27.6
Per Cent Increase in Ht.	224.68		246.16		180.77		213.67		127.27		216.02	

* WI equals height when infected; WD, height when dead.

These data suggest that on the average, a tree, if infected before one foot in height, will double in growth before death. In some cases, height-growth may increase by four times before death. Since one-third of the infected trees on the area are still alive, much greater increases in height can be expected before death from the rust. Also, a better basis of judgment will be obtained by analyzing all plot data.

General Discussion of Purposes and Results from Hollywood Plot 9 Study

A major regional problem in blister rust control is the protection program necessary to assure the reestablishment and maturity of well-stocked western white pine stands on cutover lands. Evidence being accumulated points to the fact that the problem in the Clearwater exceeds, or at least equals, all other forests in the region. For one reason, climatic conditions are more favorable, more often and over longer periods of time for pine infection than in other parts of the region. Consequently, the waves of infection are generally more severe, and minor waves may occur only on this forest. For instance, a considerable amount of infection developed on the Clearwater Forest in 1943 and 1944, which did not occur to any extent on the other forests. Also, for some time it has been realized that blister rust infection for a particular wave year was more severe in the southern part of the white pine region than in the northern part. This difference has been ascribed to the presence of the black currant, *R. petiolare*; but with the elimination of most of this species, the difference is still present. Therefore, consideration must be given to the possibility that the difference is due to more favorable climatological conditions for the development of the rust. This difference may also have some influence upon the germination of ribes seed.

The object of the study on Hollywood Plot 9 is to follow the history of this representative cutover area to obtain information on the development and damage from rust in young stands of reproduction. The number of ribes and feet of live stem are being maintained at somewhat the same standard as on adjacent control area. At present all ribes are small and of a type difficult to find. Thus far, little damage from the rust has been done due to heavy pine stocking on the area. On less heavily stocked areas, the loss would be quite severe. Continuation of the study will determine the effect the few remaining ribes have upon stocking as trees become older. It will also determine for how long a time the appearance of new ribes will complicate the problem.

Sampling Study. The question often has been raised whether this plot could not be partially sampled to obtain information comparable to that secured by inspecting all the plot. With completion of such a study now in progress, the results will be issued as a separate report.

Notes on Pruning Experiment

To determine the effect of pruning the lower one-third of the height of trees 12 to 15 years old, 36 pairs of trees were established in 1945 on the Powder House Plot. One tree of each pair is pruned one-third its height, and the other used as a check. Diameter measurements were made at $2\frac{1}{4}$, $4\frac{1}{2}$, and $6\frac{3}{4}$ feet above the ground. Comparing measurements this year with last year indicates some decrease in diameter growth due to the pruning. This decrease is more pronounced the lower the measurement on the tree. Height measurements were not taken this year but will be recorded at the end of the experiment.

All of the trees pruned last year were examined again this year. Thirteen died during the early part of this season. An examination of these trees revealed that four had apparently died from root rot; five from a combination of root rot and beetle attack, *Dendroctonus valens*; and four were killed by the beetle

alone. In these latter cases, the beetle had girdled the trees at ground level. Their channels extended down each of the main roots of the tree for a considerable distance. In one case the channel extended $5\frac{1}{2}$ feet down the root.

Twelve additional trees were found infested with the beetle.

No serious winter injury or summer burn was observed on any of the pruned trees.

METHODS AND FIRST-YEAR RESULTS, AMES CREEK SMALL BUSH STUDY

During the summer season of 1946, a R. lacustre small bush study was established on Ames Creek, Northern Rocky Mountain Forest and Range Experiment Station, Deception Creek Experimental Forest, near Coeur d'Alene, Idaho.

The North Fork of the Coeur d'Alene River, of which Ames Creek is a subdrainage, is a stream of some 30 miles in length, draining about four townships of western white pine timber land within the Coeur d'Alene National Forest. Conditions exist on the lower north and east-facing slopes of this river which combine to make a difficult problem in ribes eradication. These slopes support large populations of small, screened R. lacustre bushes, which are frequently passed over in hand eradication work. Failure of the average eradication crews to detect and remove these bushes has resulted in much of the area in the drainage failing to meet existing blister rust control standards. Economic limitations have made it necessary to question the value of continued reworkings in view of the unknown capabilities of such small ribes to spread the blister rust fungus to adjacent white pines.

Thus, it became the purpose of this study to determine the infective potential of small R. lacustre bushes remaining after the performance of hand eradication work on an area typical of the North Fork drainage. A 34-acre study area, located on Ames Creek (Experiment Station Silvical Plot No. 61), representative of the desired working conditions, was chosen. The area lies on a northeast-facing slope, enclosed on three sides by well-defined, timbered ridges, and on the fourth by a steep valley bottom. These topographical factors combine to make the study area relatively well protected with respect to long-distance spread of the blister rust from other drainages or from the opposite slopes of Ames Creek (Figures 1 & 2). The study area was known to support a heavy concentration of small R. lacustre bushes, either originating after experimental cutting and burning of several years ago, or remaining after a previous eradication working. It was also known to support a moderately well-stocked stand of western white pine reproduction mostly under ten years of age and already infected by the blister rust fungus. In addition, the area was scheduled for eradication reworking during the summer of 1946 so that detailed eradication information would be available.

Methods

A systematic, line-plot method of sampling was employed. Four staked, one-fifth chain wide strips were laid out from creek bottom to ridge top at five-chain intervals within the study area (Figure 2). These sample strips totaled 55 chains in length (1.1 acres), with the more important light, temperature, and moisture variations of the study area being about equally represented.

Data concerning ribes location, height, exposure, live stem, and current season blister rust infection were recorded for each bush on the sample strips. Pine reproduction on the sample strips was examined to obtain data from which could be calculated the total and distributed stocking, the percentage of rust infection of the total stocking, and the rust damage to the total and distributed stocking. Supplementary information on blister rust cankers was also recorded. Climatological data recorded at nearby Experiment Station Headquarters

were also examined to aid in the interpretation of past weather as it influenced pine infection on the study area.

Prior to the establishment and examination of the permanent sample strips, a ten per cent sample of the ribes eradicated during the 1946 working was examined to obtain information on the number and size of ribes on the area during the year 1941. This information was easily obtained by counting back along the yearly nodes of the ribes stems and measuring the live stem present in 1941. It was desired for comparison with 1941 pine infection data as an indication of the amount of infection which might be expected to originate from a known number of small ribes during a year especially favorable to rust spread. Other supplementary information was obtained from a 20 per cent check for ribes applied to the study area immediately following eradication work.

Study Area History

The experimental project of logging the mature white pine timber previously covering the study area slope was established by the Experiment Station in 1935. Logging was done in alternate clearcut and shelterwood strips. When completed, three shelterwood strips four to five chains wide, separated by two clearcut strips four to seven chains wide, remained (Figure 1). About 70 per cent of full sunlight passed through the shelterwood canopy. Slash on the shelterwood strips was piled and burned in 1936; that on the clearcut strips was broadcast burned the same year. This single burn, combined with other favorable environmental conditions, caused ribes seed stored in the forest floor mantle to germinate abundantly. In 1938 Moss recorded 254 ribes seedlings per acre on the shelterwood strips and 622 ribes seedlings per acre on the clearcut strips. Over the entire area he found about five per cent of the seedlings infected with blister rust (approximately one leaf on every other bush infected).

Two ribes eradication workings had been undertaken on the study area prior to 1946. The initial working (1934) resulted in about six bushes per acre being removed from the 77 acres including and surrounding the study area. The second working (1939 & 1940) was performed soon after logging, while most of the ribes were one to three-year-old seedlings and quite difficult to detect. From 17 to 137 ribes per acre were removed in the second working.

In 1938 the Experiment Station established five reproduction transect lines on the area to determine the effectiveness with which mature white pines remaining on the three shelterwood strips would restock the ground beneath them and in the intervening clearcut strips. Average percentages of full four-milacre stocking as determined on these lines during 1939 and 1943 were 18 and 64, respectively.

From existing indications, blister rust entered the reproduction stand in 1937, establishing itself on a very few trees scattered over the study area. During the period from 1940 to 1944, the rust has intensified on pines around these original centers and spread generally to ribes and pines over the entire area.

Figure 1. Deception Creek Experiment Station, Silvical Plot No. 61, showing the three shelterwood strips separated by clearcut strips. Sample strips I and III fall mostly in the open on the clearcut areas while strips II and IV fall mostly in the semi-shade of the shelterwood areas.

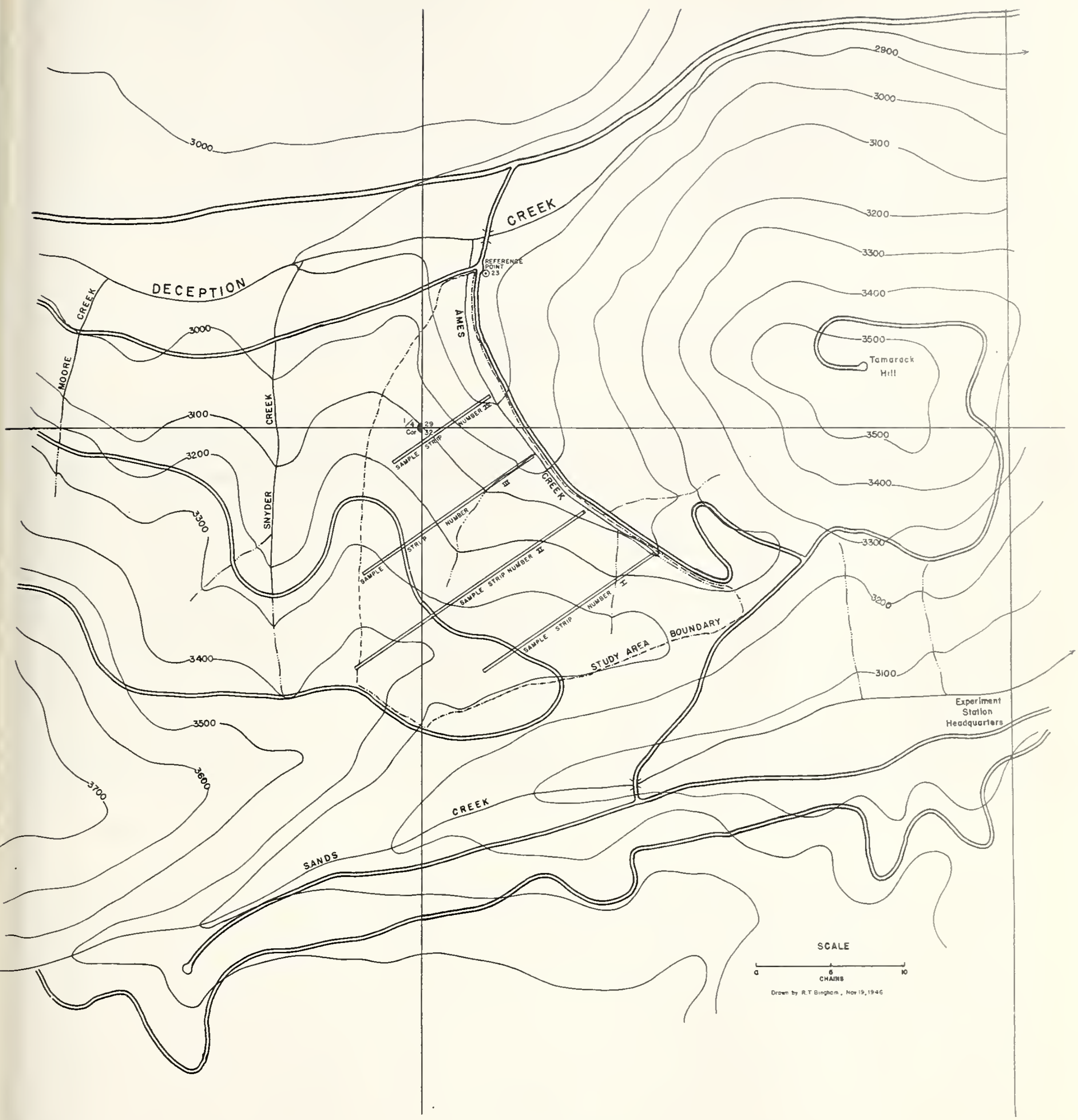


FIGURE 2.

AMES CREEK AND VICINITY SHOWING THE RIDGE AND STREAM BOUNDARIES OF THE 34-ACRE STUDY AREA AND THE FOUR PERMANENT SAMPLE STRIPS.

Discussion and First-Year Results

Climatological Data, 1936 to 1945. The completion of this study depends on the occurrence of a season extremely favorable for pine infection. It is only under the most favorable conditions for rust spread that the unknown capabilities of these small bushes can be determined. The occurrence of such a season depends to a large extent on the local weather prior to and during the season for pine infection. In the past the study area has undergone only one season (1941) during which all rust and weather factors necessary for abundant pine infection are believed to have been present. In an attempt to obtain additional information on the infective potential of small bushes during 1941, a comparison of weather, ribes, and pine infection data for that year was made. Weather data are given in Table 1.

TABLE 1

CUMULATIVE AND MEAN MONTHLY CLIMATOLOGICAL DATA,
DECEPTION CREEK EXPERIMENTAL FOREST, 1936 - 1945

Year	Cumulative Monthly Rainfall, Inches					Mean Temp., °F.		Date of First Frost Temp. 32°F. or Lower
	May	June	July	August	September	August	September	
1936	2.45	4.13	0.92	0.72	1.92	59.9	51.3	Aug. 31
1937	1.70	6.02	1.25	2.12	1.74	56.9	53.9	Aug. 15
1938	1.69	1.91	0.33	1.04	1.16	57.4	58.5	Aug. 3
1939	1.10	4.06	0.35	0.04	1.93	60.5	53.6	July 17
1940	2.18	1.18	1.28	0.24	4.21	60.3	58.3	Aug. 14
1941	8.46	3.30	0.24	1.63	5.35	61.0	49.4	Sept. 21
1942	5.67	4.88	1.43	0.33	0.28	61.4	54.2	Aug. 27
1943	4.41	3.30	0.52	0.83	0.34	58.2	53.6	Sept. 3
1944	4.14	1.53	0.92	2.08	3.91	59.0	55.4	Aug. 20
1945	3.71	2.21	0.00	1.06	2.55*	61.9	----*	Aug. 21
Means	3.55	3.25	0.77	1.01	2.33	59.7	54.2	Aug. 20

(*) Record incomplete, September 1 - 8 only.

In the light of experimentally-determined growth requirements of the various stages of the blister rust fungus, the climatological data for 1941 are noteworthy. When comparison is made between 1941 data and the 10-year means, it can be seen that 1941 differs greatly from the mean in most of the climatic factors considered. It is difficult to interpret the exceptionally wet early season climate of 1941 in relation to rust inoculation and intensification on ribes. It is noteworthy, however, that the late fall weather was excessively rainy and cool, and that there was an exceptionally late first frost. The occurrence of wet weather during the late fall period for pine infection is not in itself an assurance of extensive pine infection. It is believed that when exceptionally wet fall weather is preceded by a dry summer in which sporidial inoculum is not dissipated, and by a spring season characterized by the production of a large volume of aecial inoculum, a general and heavy spread of the rust from ribes to pine may be expected. This seems to have been the case

in 1941. August and September rainfall was twice that of the 10-year mean. The fall months were preceded by a dry summer and by a spring season during which many cankers of 1937 origin fruited for the first time.

The duration of the wet and cool periods during the period for pine infection is of more importance in limiting the extent of rust spread than is the overall amount of rainfall. Table 2 shows the fall season of 1941 to have been exceptional in respect to the total number of the continuous 24 to 36-hour rainy periods necessary to initiate pine infection. The dates and severity of early season frosts are included in the table as a possible indication of the termination of the pine infection season due to ribes defoliation.

TABLE 2

PERIODS OF WEATHER FAVORABLE FOR PINE INFECTION,
AND FROSTS WHICH INDICATE TERMINATION OF THE PINE-INFECTION SEASON,
DECEPTION CREEK EXPERIMENTAL FOREST, 1936-1945

Year	Dates of Favorable Weather		Total Days Favorable for Infection	Occurrence of Frosts	
	August	September		Dates	Temp. in °F.
1936	23-24	1-3	5	Aug. 31 Sept. 9 Sept.10	32 29 29
1937	1-2 8-9 23-24	4-5	8	Aug. 15 Aug. 16 Aug. 28	31 30 28
1938	13-14 17-19	5-9	10	Aug. 3 Aug. 9 Aug. 12 Aug. 13	32 31 32 29
1939	None	5-6 11-14	6	July 17 Aug. 7 Sept. 7 Sept. 8	32 32 31 30
1940	None	4-5 13-14 17-19 21-22	9	Aug. 14 Oct. 26	30 31
1941	26-28 31	1-4 9-15 19-20 25-26 29-30	21	Sept.21 Sept.22 Sept.28	32 30 24
1942	30-31	None	2	Aug. 27 Sept.12 Sept.15	32 32 28
1943	4-5 21-22	None	4	Sept. 3 Sept. 6 Sept. 8	29 31 28
1944	12-15	1-2 13-16 19-20	12	Aug. 19 Aug. 20 Aug. 21 Aug. 22 Sept.17	32 31 32 32 30
1945	13-14 25-27	4-6*	8*	Aug. 20 Aug. 21	29* 31

* Record incomplete, Sept. 1 - 8 only.

Characteristics of the Ribes Present on the Study Area in 1941. Data on the ribes removed in the 1946 working, inspected to determine 1941 and pre-eradication 1946 live stem of the study area, were interesting from the standpoint of ribes regeneration and development. However, these data could not be applied in determining the infective potential of a given number of small bushes during 1941. In taking the 10 per cent sample, a total of 640 bushes were examined. Of these, 617 were found to have been established seedlings prior to 1941. Table 3 shows the number and sizes of bushes present in 1941 and 1946.

TABLE 3

FREQUENCY DISTRIBUTION BY FEET OF LIVE STEM SIZE-CLASSES, AMES CREEK RIBES, 1941 AND 1946

Size-Class Feet of Live Stem	Number of Bushes Per Size-Class in 1941	Number of Bushes Per Size-Class in 1946
Seedling - 0.1	203	13
0.2 - 0.5	288	143
0.6 - 1.0	74	140
1.1 - 2.0	31	154
2.1 - 5.0	15	106
5.1 - 10.0	5	51
10.1 - 50.0	1	29
50.1 - 100.0	0	3
100.0 - Plus	0	1
Totals	617	640

It will be noticed that the sample contained 21 bushes having more than two feet of live stem in 1941. This means that there were approximately 6 bushes per acre of this size present on the study area in 1941. It is believed that a ribes population representative of the North Fork drainage would contain neither as many nor as large bushes as were found on Ames Creek where eradication work followed soon after logging.

Per acre totals were neither exceptionally high nor low for the North Fork area, the estimates being 180 bushes with 100 feet of live stem in 1941, and 187 bushes with 607 feet of live stem in 1946. It is interesting to note that only 23 (3.6 per cent) of the bushes became established after 1941. Under conditions existing during and after the opening of the mature stand, it could be expected that the greater proportion of the stored ribes seed would germinate in a relatively short period of years. Between 1942 and 1946 live stem on the study area was estimated to have increased about six times, from 3,369 to 20,456 feet.

Pine Infection and Damage During 1941 and Later Years. A sufficient number of cankers of 1937 origin was present on the study area during 1941 to effect a light but general infection of ribes then present on the area. Due to characteristic lack of uredial build-up on R. lacustre, there was probably not a great amount of rust intensification on ribes during late spring and summer. Infection of pine during the fall season, however, was probably disproportionately great due to almost optimal weather conditions persisting for nearly twice the normal

length of time. Table 4 shows the percentages of the total stocking infected during seasons in which it has been estimated that pine infection occurred.

TABLE 4

PERCENTAGE OF INFECTION OF TOTAL STOCKING BASED ON THE STOCK PRESENT DURING THE YEARS IN WHICH INFECTION PROBABLY OCCURRED

	Years in Which Infection Occurred				
	1937	1941	1943	1944	1946
Number of Trees on Sample Strips	104	501	567	575	587
Estimated Number of Trees Per Acre	95	455	515	523	534
Percentage of Infection	?	5.4	7.1	7.8*	7.8*
Residual Uninfected Stand Per Acre	95	430	478	482	492

* Percentages are low, as all cankers originating in later years are not visible.

The sudden increase in pine infection during 1941, and the more regular increase since that year are apparent. The Ames Creek reproduction stand is still on the increase, and the number of newly-established trees has exceeded the number infected each year. In young age classes of white pine like those on the study area nearly all infected trees will eventually succumb to the rust. Thus, in Table 4 an apparent loss of 7.8 per cent of the reproduction stand (about 42 trees per acre) will eventually occur. This percentage of loss to total stocking is compared below with similar figures calculated in view of stocking distribution.

TABLE 5

LOSSES TO THE TOTAL AND DISTRIBUTED STOCKING DUE TO PINE INFECTION BY THE BLISTER RUST FUNGUS

	1941		1946	
	Totals	Percentages	Totals	Percentages
TOTAL STOCKING LOSSES:				
No. Trees Surviving	475	94.8	545	92.8
No. Trees Lost	26	5.2	42	7.2
Total No. Trees	501	100.0	587	100.0
DISTRIBUTED STOCKING LOSSES:				
Basis 1,000 Trees Per Acre (Milacre Units)				
No. Units Stocked w/Surviving Trees	334	30.4	366	33.3
No. Units Stocked but Trees Lost	10	3.0	19	5.2
No. Units Unstocked	756	66.6	715	61.5
Total No. Units Examined	1,100	100.0	1,100	100.0
Basis 250 Trees Per Acre (4-Milacre Units)				
No. Units Stocked w/Surviving Trees	175	63.6	188	68.4
No. Units Stocked but Trees Lost	2	1.1	6	3.2
No. Units Unstocked	98	35.3	81	28.4
Total No. Units Examined	275	100.0	275	100.0

Damage to total and distributed stocking for trees examined on the four permanent sample strips is shown in Table 5. A small number of infected trees were found on which the cankers were judged harmless, so the percentages of damage shown in this table are slightly less than the percentages of infection shown in Table 4. The lost or damaged trees were found to be so distributed on the sample strips that they represent less loss to distributed than to total stocking. Up to the present time only 19 of 344 stocked milacre units on the sample strips represent a loss in the 1,000 trees per acre distributed stocking due to blister rust. Similarly, only 6 of the 194 stocked four-milacre units represent a loss in the 250 trees per acre distributed stocking. The percentages of trees lost from total stocking in 1941 and 1946 are almost twice as great as the percentages of occupied four-milacre units lost during the same years.

Average percentages of full four-milacre stocking as determined by the Experiment Station in 1939 and 1943 were 18 and 64, respectively; those determined in this study for 1941 and 1946 were 64 and 68, respectively. The differences in the percentages are probably caused by the fact that the Experiment Station records only trees six inches and taller, while in this study all pine reproduction, including established seedlings, was tallied.

In summarizing the results, it should be emphasized that estimations of blister rust losses to white pine stocking are based on nearly 600 trees, of which less than 50 were infected. From this small a sample it would seem that 1941 infection had but a slight effect in reducing the distributed stocking on the area. Later infection has about doubled the loss, but it is still so small that distributed stocking may be considered relatively undisturbed up to the present time.

<u>Present Control Status of the Study Area and Sample Strip Ribes Data for 1946</u>. At the conclusion of the 1946 eradication work a 20 per cent systematic sample (check) was made of the study area to determine the numbers and characteristics of the ribes remaining on the area. This large sample was taken to supplement information obtained from the sample strips. Data obtained from the 20 per cent check and from the four sample strips are compared in Table 6.

TABLE 6

CHARACTERISTICS AND DEGREE OF INFECTION OF RIBES EXAMINED DURING THE 20 PER CENT CHECK AND ON THE FOUR PERMANENT SAMPLE STRIPS, 1946

	20 Per Cent Check Ribes	Sample Strip Ribes
Total Number Bushes Examined	214.0	71.0
Average Number Bushes Per Acre	32.0	64.5
Total Feet of Live Stem Examined	213.6	46.5
Average Number of Feet of Live Stem Per Acre	32.0	42.3
Feet of Live Stem Per Average Bush	1.0	0.7
Height Above Ground of Average Bush (Ft)	0.5	0.4
Number of Leaves Per Average Bush	20.9	12.3
Per Cent of Bushes in Exposed Positions	11.2	12.8
Per Cent of Bushes in Half-Screened Positions	44.9	39.4
Per Cent of Bushes in Screened Positions	43.9	47.8
Per Cent of Bushes Infected	80.0	73.2
Per Cent of Leaves Infected Per Average Bush	--	38.3
Number Square Millimeters of Live Telia-Bearing Leaf Surface Per Average Bush	--	141.2

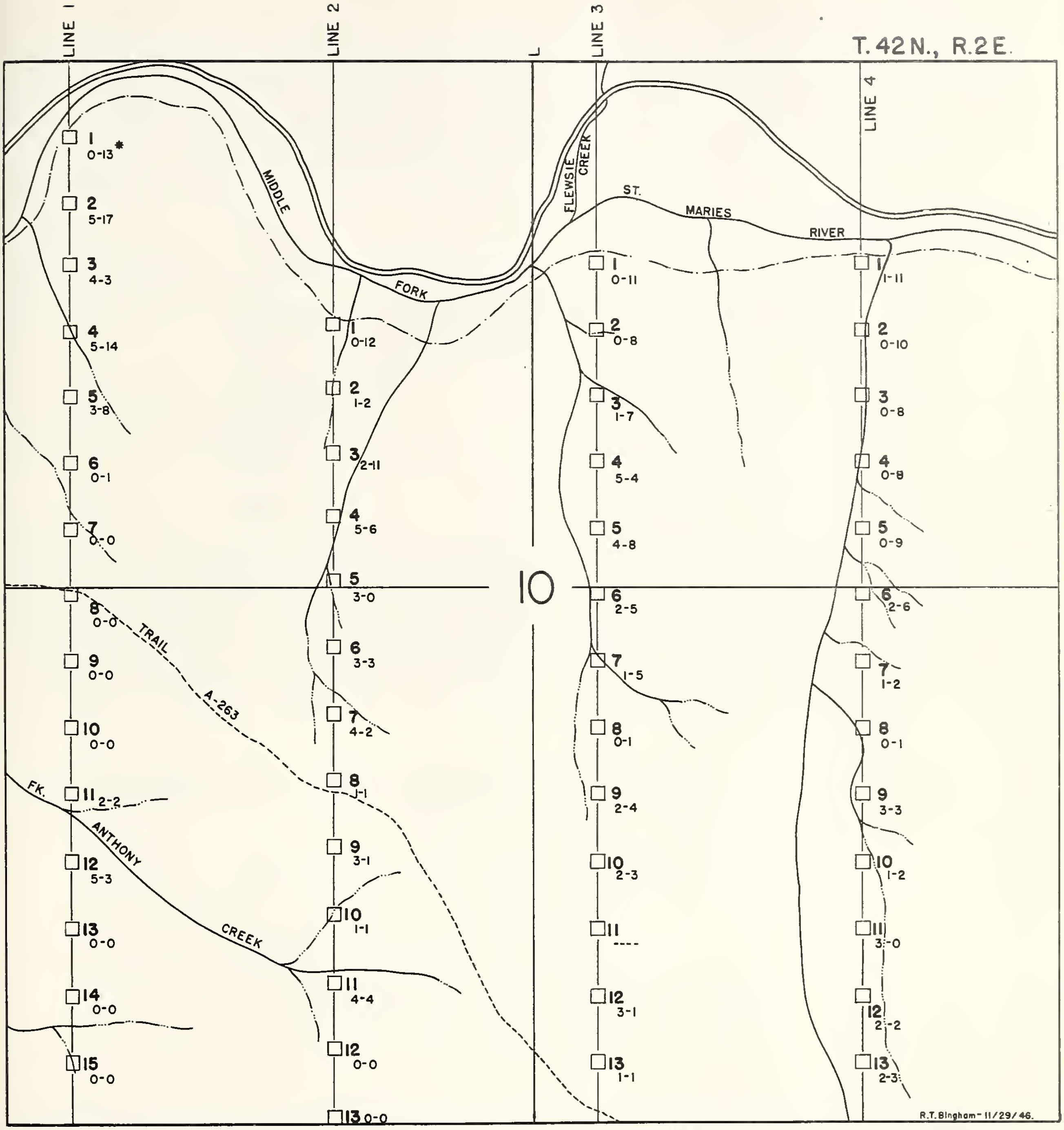
Results of the 20 per cent check show that besides the 137 bushes with 607 feet of live stem per acre removed by the eradication crews in 1946, there remain on the study area about 32 undetected bushes with 32 feet of live stem per acre. This number of missed bushes is about average, considering the difficulties encountered while searching for such small, well-screened bushes. The average residual bush has about one foot of live stem, supporting about 21 leaves. It reaches a height of only about one-half foot above ground level, is usually half or completely screened by surrounding vegetation, and is infected by the blister rust fungus in about four out of five cases.

The estimate of the number of ribes per acre based on the smaller sample contained in the four permanent sample strips is double that based on the 20 per cent check. The characteristics of the average sample strip bush, however, are similar in most respects to those of the 20 per cent check bush. The sample strip bush is slightly smaller, lower to the ground, and has fewer leaves, but is almost identical as to its screening and its degree of infection by the blister rust fungus.

Both estimates show that about three-quarters to four-fifths of the study area bushes were infected in 1946. The amount of sporidial inoculum which the infected bushes are capable of producing during late August and September periods when pine infection ordinarily occurs is, however, more important in determining the extent of pine infection during any one year than is the proportion of the bushes which are infected. Measures of the amount of sporidial inoculum available during the critical periods are the percentage of the ribes leaves then

infected, or better, the area of ribes leaf surface which at the beginning of the critical period bears live ungerminated telia. Measurements on the percentage of ribes leaves infected and on the area of infected leaf surface were made on the sample strips about August 15, 1946. These showed that the average sample strip bush had about 40 per cent or five of its twelve leaves infected, and that it supported about one and one-half square centimeters of live, ungerminated, telia-bearing infected leaf surface. The area of telia-bearing leaf surface would probably have been greater had not a fairly hot and dry early autumn plus early frosts resulted in premature casting of many infected leaves, and in many rust leaf-spots becoming necrotic.

It has already been pointed out that a true measure of the infective potential of these small ribes cannot be obtained until pine infection has been measured following a year extremely favorable for rust spread. Such a year was 1941, but neither the rust nor ribes concentrations on the area were suitable for this study. Since the small amount of new pine infection indicates that such a critical year has not occurred between 1942 and 1945, and since rust conditions in 1946 were similar to these four years, this study must be continued for at least several more seasons to obtain the desired information. A complete report on methods and results of this study will be issued in the near future in the form of a serial report.



(*) NUMBERS 1 / 0-13 REFER TO PLOT NUMBER (1), AND TO NUMBERS OF SURVIVING (0) OR RUST DAMAGED (13) WHITE PINE CROP TREES ON THE PLOT.

FIGURE 1.

SECTION 10, SHOWING THE 54 ONE-TENTH ACRE SAMPLE PLOTS AS THEY WERE LAID OUT ON 4 LINES FOR THE POLE DAMAGE STUDY. NOTE HEAVY RUST DAMAGE ALONG THE RIVER AND THE POOR WHITE PINE STOCKING BETWEEN STREAMS ON THE RIDGES.

BLISTER RUST DAMAGE TO POLE-SIZED WESTERN WHITE PINE
ON THE MIDDLEFORK ST. MARIES RIVER

One section, representative of several in a heavily infected pole stand of western white pine, along the Middlefork St. Maries River, east of Clarkia, Idaho, was examined to determine the probable extent of blister rust damage. The stand examined is believed to have been infected in 1923 and has been under surveillance since 1928 when the rust was first discovered. The actual extent of present damage and the estimated future loss of white pines are unknown. Accordingly, this study was undertaken.

The stand was found to be composed of about 166 dominant and co-dominant crop trees per acre, divided among several species as follows:

Present Stand Composition (Crop Trees Per Acre)

Western White Pine	58
Western Larch	55
Douglas Fir	22
Grand Fir	10
Others	21
Total	166

Present blister rust damage to white pine crop trees is severe, 42 poles per acre or about 70 per cent being damaged. Dying of damaged white pines has only recently started, because older cankers of 1927 to 1937 origin are just beginning to completely girdle trunks and cause top-flagging. A small loss occurring annually among white pine poles, possibly as great as 3 to 5 per cent, is easily overlooked, especially since white pine stems compose only about one-third of the total stand.

It is estimated that within 20 years losses in white pine crop trees will cause stand composition to change approximately as follows:

Surviving dominant and co-dominant white pines	16
Surviving intermediate white pines which will have replaced damaged dominant and co-dominant white pines	4
Dominant and co-dominant western larches	55
Dominant and co-dominant Douglas firs	22
Dominant and co-dominant trees of other species	31
Intermediate trees of other species which have replaced damaged dominant and co-dominant white pines	19
Total number of crop trees per acre	147

White pine heights are increasing about $2\frac{1}{2}$ to 3 feet per year, diameters about 0.25 inches per year. Should annual losses in white pine crop trees reach or exceed 5 per cent, increases in white pine volume will exceed volume losses due to blister rust for only about 10 years.

A complete Methods Project Serial Report on this damage study will be issued from the Berkeley Office of Blister Rust Control.

III. LABORATORY, GREENHOUSE, AND SPECIAL ACTIVITIES

Principal laboratory and greenhouse activities related to the testing of 2,4-D in various concentrations and dosages and with several amendments serving as spreaders and markers. On the basis of these tests the butyl ester, triethanolamine salt, ammonium salt, and sodium salt of 2,4-D were selected for field tests, and Titanox B30, Velvet White, Desert Whiting, and sulfur as markers. Tergitol No. 7 was found to be satisfactory as a spreader. Summer emulsion oil appeared to improve toxicity of 2,4-D to resistant ribes such as R. lacustre.

Greenhouse tests on the susceptibility of ribes to 2,4-D showed the following species reactions:

1. Highly susceptible to 2,4-D: R. bracteosum, R. petiolare, R. roezli.

2. Moderately susceptible to 2,4-D: R. cereum, R. cruentum, R. erythrocarpum, R. nevadense, R. sanguineum, R. viscosissimum.

3. Moderately to highly resistant to 2,4-D: R. binominatum, R. glutinosum, R. inerme, R. lacustre, R. lobbii, R. menziesii, R. montigenum, R. tularense.

Ribes in Class 1 above were killed by application of aqueous 2,4-D to aerial plant parts in concentrations as low as 90 ppm acid equivalent. Those in category 2 required a top spray of at least 750 ppm and a supplementary crown treatment for satisfactory kill. Preliminary tests of butyl ester and triethanolamine concentrates showed that ribes in class 2 could be killed by thorough coverage of leaves and stems by these finely atomized concentrates (20,000 ppm) of these chemicals. Ribes in class 3 were not significantly damaged by dilute aqueous sprays. Some top damage was obtained with mixtures of summer oil and 2,4-D butyl ester concentrates, but further experimental work is needed to devise improved herbicides for class 3 ribes.

In cultures of R. roezli seeds treated with 2,4-D, data showed that contact with 1,000 ppm of the sodium salt of 2,4-D for 24 hours reduced viability of seed from 92 per cent germination (in the control) to 14 per cent, and 200 ppm of the same chemical for 48 hours prevented germination (0 per cent).

Investigations were made of truck-mounted power spray rigs, of portable power sprayers, and of spray accessories such as hose, couplings, and nozzles in respect to the performance required of this equipment for practical field work.

Further progress was made in studying the germinative reaction of ribes and white pine seeds. Some changes are indicated in previously recommended methods for extracting ribes seeds from duff and soil samples to prevent loss of ribes seeds in the seed cleaning mill. Shop work was continued in the design of a machine for cracking western white pine seeds scheduled for direct seeding tests.

The following published papers or special research reports dealing with the above-mentioned subjects are recorded for the information of Blister Rust personnel:

Serial No. 131:
An Efficient System for Culturing Large Numbers of Small Seeds.
. . . . . . C. R. Quick

Serial No. 132:
Ecology of the Ribes Associated with Sugar Pine - A General Statement
. . . . . . C. R. Quick

Bureau MS 7711:
Rapid Estimation of the Phytocidal Action of Chemicals.
Science 103: 474-476. 1946.
. . . . . . H. R. Offord

Bureau MS 8081:
Control of Host Plants in a Plant Disease Program.
Western States 8th Annual Weed Control Conference, pp. 39-43.
Reno, Nev. Feb. 26-27, 1946.
. . . . . . H. R. Offord

Chemical War Waged on Blister Rust.
Timberman Vol. XLVII, No. 12, pp. 39, 74, 78. Oct. 1946.
. . . . . . George A. Craig

PHOTOGRAPHIC AND EDUCATIONAL WORK, 1946

By

Frank O. Walters, Assistant Regional Leader
H. Miller Cowling, Photographic Specialist

With materials more readily available, there has been an expansion in activities of the photographic section. The transposing of all ribes eradication maps from the township to working unit basis caused heavy demands for black-line prints. The complete revision of the Inland Empire Ribes Eradication and Checking Manual and revision of many field forms heavily increased the Multilith and mimeograph work.

The photographic section extends its services to the Pacific Coast Region and to Pear Psylla Control.

A. Photographic Section

The purpose of this section is: (1) To maintain a pictorial record of control and investigative work, (2) to supply photographs, charts, maps, and manuals for facilitating the field work, and (3) to supply material for educational work.

Although photography is the major project of this section, other operations are Multilith offset printing, black-line printing, and mimeograph work. A summary of the 1946 work is given in the following table:

PHOTOGRAPHIC, MULTILITH, BLACK-LINE, AND MIMEOGRAPH WORK

Item	Northwestern Region	Pacific Coast Region	Pear Psylla Control	Total
PHOTOGRAPHIC				
Lantern slides, natural color	77			77
Lantern slides, black and white	4			4
Films developed, field films	119			119
Copies, 5x7	46	1	108	155
8x10	83	5	4	92
Printing, 5x7	1,098		48	1,146
8x10	5	45		50
9x11	826	32	145	1,003
Enlarging, 11x14 or smaller	64			64
16x20	2	12	84	98
18x22		26	14	40
Total items	2,324	121	403	2,848
MULTILITH				
Copies	43	14	6	63
Plates made	38	14	2	54
Cards printed	4,900	7,000	5,000	16,900
Cards printed, both sides	3,700	7,000	5,000	15,700
Total cards	8,600	14,000	10,000	32,600
Paper printed	73,400	10,000	9,500	92,900
Paper printed, both sides	16,100	1,500	8,000	25,600
Total paper	89,500	11,500	17,500	118,500
Total items	98,181	25,528	27,508	151,217
BLACK-LINE PRINTER				
Total maps printed	537		2,295	2,832
MIMEOGRAPH				
Total paper	14,350			14,350

B. Educational Section

As a part of on-the-job training, all employees were given fundamental information concerning the economic and pathological phases of blister rust control.

A greater effort was made to get those concerned with the white pine lumber industry into the field and intimately acquainted with control problems.

1. Bulletins and posters. The supply of suitable literature is running out. Requests for additional material have not been filled.

   Literature was made available to all camps. Two hundred and twenty-three pieces of material were passed out to persons calling at the Spokane office.

2. Talks, slides, and motion pictures. The narrative for a training film has been prepared. If the diagrammatic portion of the film can be completed this winter, enough field pictures have been taken so that the partially-completed film can be used for training purposes next field season.

   The western blister rust film was shown 22 times before a total audience of 880 people.

   For the second successive year use was made of the Balopticon to display blister rust slides at the County Fair in Coeur d'Alene, Idaho.

APPROPRIATIONS
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
NORTHWESTERN REGION OF BLISTER RUST CONTROL

Regular Appropriations

Fiscal Year 1946:

Project 3101.14 (Administrative)		$103,600.00	
Project 3103.14 (Cooperative)		224,400.00	
			$328,000.00

Fiscal Year 1947: (as of 12/31/46)

Project 3101.14 (Administrative)		$121,000.00	
Project 3103.14 (Cooperative)		681,011.00	
			$802,011.00

Contributed Funds (deposited with U. S. Treasury)

State of Idaho		$ 15,000.00	
Clearwater Timber Protective Association	$6,416.58		
Potlatch Timber Protective Association	5,262.40		
Priest Lake Timber Protective Association	4,260.44	15,939.42	
			$ 30,939.42

TABLE 1

FEDERAL EXPENDITURES, NORTHWESTERN REGION OF BLISTER RUST CONTROL
CALENDAR YEAR 1946, REGULAR APPROPRIATIONS

Project		Salaries	Expense	Total
	January 1 to June 30, 1946			
I	Planning, Coordination, Technical Direction			
	1.1 - Clearwater Operation, Idaho	$ 5,423.85	$ 960.42	$ 6,384.27
	1.2 - St. Joe Operation, Idaho	7,414.79	1,381.91	8,796.70
	1.3 - Coeur d'Alene Operation, Idaho	2,039.96	71.77	2,111.73
	1.4 - Kaniksu Operation, Idaho	14,359.77	3,603.08	17,962.85
	1.6C - Cabinet Operation, Montana	964.99	95.04	1,060.03
	1.6K - Kootenai Operation, Montana	964.99	95.53	1,060.52
	1.7G - National Park, Glacier	1,092.25	--	1,092.25
	1.7R - National Park, Rainier	--	--	--
	1.7Y - National Park, Yellowstone	1,660.89	209.16	1,870.05
	1.A - Office Maintenance	11,354.54	4,651.53	16,006.07
	1.B - Supervision	6,062.93	582.51	6,645.44
	1.C - Education and Information	--	74.88	74.88
	1.D - Control Investigations	1,682.16	17.90	1,700.06
	1.E - Methods Development	--	74.62	74.62
	Total, Project I, Jan. 1 - June 30, 1946	$ 53,021.12	$11,818.35	$ 64,839.47
III	Cooperative Ribes Eradication on State and Private Lands			
	3.1 - Clearwater Operation, Idaho	$ 26,419.05	$13,539.83	$ 39,958.88
	3.2 - St. Joe Operation, Idaho	35,805.96	20,392.41	56,198.37
	3.4 - Kaniksu Operation, Idaho	14,745.99	15,027.21	29,773.20
	Total, Project III, Jan.1-June 30, 1946	$ 76,971.00	$48,959.45	$125,930.45
	July 1 to December 31, 1946			
I	1.1 - Clearwater Operation, Idaho	$ 7,435.23	$ 902.24	$ 8,337.47
	1.2 - St. Joe Operation, Idaho	8,566.78	1,445.86	10,012.64
	1.3 - Coeur d'Alene Operation, Idaho	4,123.98	144.49	4,268.47
	1.4 - Kaniksu Operation, Idaho	9,080.75	1,006.46	10,087.21
	1.6C - Cabinet Operation, Montana	1,112.11	108.28	1,220.39
	1.6K - Kootenai Operation, Montana	1,112.11	108.28	1,220.39
	1.7G - National Park, Glacier	333.66	106.73	440.39
	1.7R - National Park, Rainier	183.71	86.91	270.62
	1.7Y - National Park, Yellowstone	1,983.11	374.33	2,357.44
	1.A - Office Maintenance	17,592.93	3,827.08	21,420.01
	1.B - Supervision	6,007.69	606.05	6,613.74
	1.C - Education and Information	--	56.60	56.60
	1.D - Control Investigations	670.80	65.53	736.33
	1.E - Methods Development	--	130.78	130.78
	Total, Project I, July 1-Dec. 31, 1946	$ 58,202.86	$ 8,969.62	$ 67,172.48
III	3.1 - Clearwater Operation, Idaho	$ 64,346.20	$27,442.00	$ 91,788.20
	3.2 - St. Joe Operation, Idaho	69,472.02	21,532.49	91,004.51
	3.4 - Kaniksu Operation, Idaho	79,150.29	28,006.48	107,156.77
	Total, Project III, July 1-Dec. 31, 1946	$212,968.51	$76,980.97	$289,949.48

TABLE 2

SUMMARY OF EXPENDITURES FROM STATE AND PRIVATE FUNDS, 1928 - 1946, IDAHO

Year	State	Private	Total
1928	$ 2,518.55	$ 2,264.32	$ 4,782.87
1929		19,027.66	19,027.66
1930		20,000.00	20,000.00
1931	5,000.00	35,905.32	40,905.32
1932	8,003.43	11,186.33	19,189.76
1933			
1934	29,154.06		29,154.06
1935	15,000.00		15,000.00
1936	16,998.25		16,998.25
1937	15,001.25		15,001.25
1938	15,000.44		15,000.44
1939	15,438.04		15,438.04
1940	10,034.48		10,034.48
1941	7,542.73	15,756.40	23,299.13
1942	22,761.68	15,440.78	38,202.46
1943	12,252.13	386.68	12,638.81
1944	12,506.60	15,612.98	28,119.58
1945	6,287.68	5,111.03	11,398.71
1946	14,943.35	26,651.65	41,595.00
Total	$208,442.67	$167,343.15	$375,785.82

Organization of the Northwestern Regional Office - 1946

1. Regional Leader in Charge, H. E. Swanson, Pathologist

2. Assistant Regional Leader, F. O. Walters, Pathologist

3. Cooperative Local Control:

    a. Clearwater Operation, Idaho:
        Operation Supervisor, F. J. Heinrich, Pathologist
        Assistant Operation Supervisor, H. J. Faulkner, Forester
        Unit Supervisor, C. W. Long, Agent
        Checker Foreman, J. C. Gonyou, Field Aid
    b. St. Joe Operation, Idaho:
        Operation Supervisor, H. J. Hartman, Forester
        Assistant Operation Supervisor, W. F. Painter, Pathologist
        Unit Supervisor, R. H. Kliewer, Agent
        Camp Superintendent, G. W. Schmaltz, Agent
        Special Duty Assistant, R. E. Myers, Agent
    c. Coeur d'Alene Operation, Idaho:
        Operation Supervisor, A. L. Pence, Jr., Forester
        Operation Supervisor, M. C. Riley, Forester
    d. Kaniksu Operation, Idaho-Washington:
        Operation Supervisor, H. A. Brischle, Pathologist
        Assistant Operation Supervisor, J. C. Gynn, Pathologist
        Unit Supervisor, L. J. Easley, Agent
        Checker Foreman, G. M. Houghton, Agent
    e. Montana Operation:
        Operation Supervisor, A. S. Skoglund, Pathologist
    f. National Parks, Washington, Montana, Wyoming:
        Operation Supervisor, M. C. Riley, Forester
        Assistant Operation Supervisor, C. M. Chapman, Pathologist

4. Projects:

    a. Education and Information:
        H. M. Cowling, Photographic Specialist
    b. Methods Development and Control Investigation (BLR-1-6):
        V. D. Moss, Forest Ecologist
        J. F. Breakey, Pathologist
        C. R. Stillinger, Pathologist
        R. T. Bingham, Agent
        (Personnel assigned to Northwestern Region by H. R. Offord)

5. Business Administration and Clerical:

    a. E. G. Schmidt, Administrative Assistant
        E. K. LaPrey, Storekeeper
        L. C. Miller, Automobile Mechanic
    b. M. L. McWold, Administrative Assistant
        M. Wilson, Clerk
        M. C. Yourt, Clerk
        B. J. Knautz, Clerk
        J. E. Bolitho, Clerk
    c. J. R. Pringle, Clerk
        A. B. Treffry, Clerk-Stenographer
        N. L. Klum, Clerk-Stenographer
    d. L. E. Klatt, Administrative Assistant, Personnel
        K. P. Schofield, Clerk-Stenographer

ANNUAL REPORT

ON

THE CONTROL OF WHITE PINE BLISTER RUST

IN THE

PACIFIC COAST REGION

FOR THE

CALENDAR YEAR 1946

United States Department of Agriculture
Agricultural Research Administration
Bureau of Entomology and Plant Quarantine
Pacific Coast Regional Office
610 Syndicate Building
Oakland 12, California
March 1947

C O N T E N T S

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WHITE PINE BLISTER RUST CONTROL IN THE PACIFIC COAST REGION

ANNUAL REPORT FOR 1946

PART I

HIGHLIGHTS OF 1946

By

Warren V. Benedict, Regional Leader

The most significant developments of 1946 were: (1) further clarification of responsibility for the conduct of blister-rust-control work on lands of federal and non-federal ownership; (2) the appropriation of sufficient federal funds to do the control job on a predetermined programed basis; (3) the testing of the chemical 2,4-D on a large scale field basis as a practical means of destroying ribes; (4) the experimental use of the contracting procedure as a method of accomplishing part of the ribes eradication work; and (5) the increase in control accomplishments arising from the expanded control program.

During its consideration of the 1947 blister-rust-control appropriation, Congress recognized the responsibility of the Federal government for leadership, coordination, and technical direction of the control program, and for all necessary control work on federal lands, and on such intermingled lands of non-federal ownership as may be necessary to protect federal holdings. It also emphasized the principle of limiting Federal aid on state and private lands to a matching basis and indicated the desirability of state and private owners increasing their contributions for cooperative control work on their lands. Increased federal funds were provided to speed up the completion of the remaining initial ribes eradication and bring the necessary rework up to date. During the war only a holding program was practicable and work on many areas fell behind schedule. Also, the control problem was increased by the need for undertaking work on sugar pine cut-over areas, where removal of the mature timber crop created conditions that favored return of ribes. Cooperating state and private agencies should provide for their share of the job of ribes eradication on lands in state and private ownership so that the control program may continue to go forward on a well balanced basis with work proportionately as far advanced on state and private lands as on federal lands (see table 3).

Accomplishments

During 1946, the four operating agencies performing control work in the Region, namely, the U. S. Forest Service, the National Park Service, the Oregon and California Revested Lands Administration for federal lands, and the Bureau of Entomology and Plant Quarantine conducting the cooperative project for state and private lands, continued ribes eradication work on lands falling to their jurisdiction. The Bureau of Entomology and Plant Quarantine in addition to operating the cooperative project provided general technical direction to the whole control program and coordinated

the work of each operating agency into one unified program. During the peak of the operating season 2,340 workers housed in 47 camps were engaged in control work as compared with 1,620 workers and 33 camps of the year before. They were distributed by agency as follows:

Agency	No. Camps	No. Workers
U. S. Forest Service	20	970
National Park Service	7	350
O & C Revested Lands Administration	3	200
*EPQ - Coop.	17	820

*Cooperative work on lands largely in state or private ownership by the Bureau of Entomology and Plant Quarantine, the State of California, the Diamond Match Company, the Michigan-California Lumber Company, and the Winton Lumber Company.

Table 1 shows the accomplishments by operating agency for 1946. For the Region as a whole the accomplishments for 1946 exceed those for 1945 by 43 per cent in acreage treated, 46 per cent in man days expended, and by 59 per cent in ribes destroyed. While there is a slight increase indicated in productiveness--the man day per acre accomplishments show 0.88 man days per acre used in 1946 whereas 0.90 man days per acre were used in 1945--the 1946 increase results primarily from the expanded control program; more men worked more man days on the job in 1946.

TABLE 1

SUMMARY OF RIBES ERADICATION WORK IN 1946

Operating Agency	Expenditures	Acres Worked		Ribes Destroyed	8-Hour Man Days Expended
		Initial Erad.	Reeradication		
U. S. Forest Service	$ 621,395	12,303	24,232	3,433,352	33,064
National Park Service	201,110	3,926	5,777	1,060,223	10,067
O & C Rev. Lands Adm.	109,914	1,600	2,678	165,369	4,681
Bureau-Coop.	*505,836	18,851	19,883	4,806,584	27,759
Totals	$1,438,255	36,680	52,620	9,465,528	75,571

*Of the total of $505,836 expended by the cooperative project, $424,639 were Federal Lea Act funds, $77,128 were funds contributed by the State of California, and $4,069 were funds contributed by lumber companies.

TABLE 2

COSTS

Operating Agency	Per Acre			Per Man Day		
	1946	1945	Average All Past Work	1946	1945	Average All Past Work
U. S. Forest Service	$16.98	$13.06	$6.53	$18.79	$15.22	$ 8.70
National Park Service	20.73	7.02	6.47	19.98	9.67	5.47
O & C Rev. Lands Adm.	25.69	20.12	8.70	23.48	19.17	17.09
Bureau-Coop.	13.06	10.70	4.62	18.22	13.04	8.83
Regional Average	$16.11	$11.29	$5.53	$19.03	$13.68	$ 8.43

The sharp increase in costs in 1945-46 above the average is the result of many factors such as (1) higher wages, (2) higher price levels, (3) shorter work week, (4) shorter operating season over which to prorate fixed costs, (5) the general low quality of labor available to the project during recent years, (6) higher standards for camp construction, sanitation, and equipment, and (7) an increasing tendency on the part of labor to be less productive.

The increase in costs for 1946 over 1945 is due primarily to the higher salaries and wages paid all classes of workers, although in part, it can be attributed to the procurement of new equipment items. For the first time in several years new equipment was to be had, replacements were sorely needed, and fairly substantial outlays were therefore made from 1946 funds for this purpose, in excess of what under normal conditions would be made in any one year--procurements to meet an expansion in the work program and to make replacements of worn out equipment which could not be done during the war years.

Operating expenses have now increased to the point and under conditions where past averages cease to have significance other than to indicate the degree of increase. It is unlikely that expenses will go back to the pre-war levels or remain at the present level. However, it is reasonable to expect they will stabilize at some in-between point and that control accomplishments per man day will rise with a reduction in costs. Chemical eradication, contracting some of the hand work, and refinements in hired labor crews, means which were in their experimental stages during 1946 and which were not yet developed to the point where we can compute accurately their saving potential, indicate possible substantial savings in time and cost.

Table 3 shows the ownership of lands worked in 1946, by operating agency. As pointed out in previous reports it is impracticable for an operating agency, other than National Park Service where ownerships are largely solid blocks of federal, to work solely on lands falling to their ownership or jurisdiction. This is because of the general intermingled pattern of land ownerships. Work units, however, are laid out in such manner as to make the exchange ownerships worked as compensating as possible, thus keeping the agency program in proper balance.

TABLE 3

OWNERSHIP OF LANDS WORKED IN 1946

Operating Agency	Total Acres Worked	Recapitulation of Acres Worked by Ownership: National Forest Lands	National Park Lands	O & C Revested Lands	State and Private Lands
U. S. Forest Service	36,585	22,360		1,258	12,967
National Park Service	9,703		9,703		
O & C Rev. Lands Adm.	4,278	634		2,630	1,014
Bureau-Coop.	38,734	6,586			32,148
Totals	89,300	29,580	9,703	3,888	46,129

This year was the thirteenth year of large-scale blister-rust-control work in the Region; in table 4 is shown the progress made in the control job over that period.

TABLE 4

STATUS OF CONTROL WORK IN THE PACIFIC COAST REGION AS OF 1946

Land Ownership	Acreage in Control Units	Acres Worked: Initial Erad.	Per cent	Reeradication	Ribes Destroyed	8-Hour Man Days Expended
National Forest	1,092,911	397,709	36	257,320	91,773,757	445,950
National Park	287,327	99,185	35	32,012	20,956,228	150,784
O & C Lands	104,145	41,898	40	3,767	1,125,609	17,755
Total Federal	1,484,383	538,792	36	293,099	113,855,594	614,489
State and Private	1,014,900	473,130	47	220,885	71,155,070	386,120
Totals	2,499,283	1,011,922	40	513,984	185,009,664	1,000,609

On the basis of an appraisal of the labor situation made in the early spring through contacts with employment offices and the Civil Service Commission, the indications were we could expect the majority of workers this first post-war season to be adults with a substantial representation of ex-servicemen. This early forecast did not materialize, and again in 1946, as during the war years, we had to fall back on school boy labor. While there were numerous unemployed adults in the Region, for one reason or another, they were in general not interested in seasonal work in the woods. Although an adequate supply of school boy labor was available at the start of the season, replacements were difficult to get from mid-season on, and after that date most of the camps operated below full strength and were forced to close down early because of insufficient labor.

New Procedures Adopted

During the field season of 1946 there were two developments in control methods of sufficient significance to warrant special comment. They are the use of the chemical 2,4-D, applied as an aqueous spray to kill ribes instead of grubbing them out and the contract method of performing ribes eradication on a land unit basis, the so-called "gyppo" job. Both bid fair to contribute substantially in speeding up control work and to reduce costs.

1. Chemical Eradication

Laboratory and greenhouse tests and small scale field studies in 1945 with 2,4-dichlorophenoxyacetic acid (2,4-D) gave promising leads. Large scale field tests in 1946 using power spray field equipment indicate that concentrations of the Sierra gooseberry can be killed by 2,4-D in better than one-fourth the time and at about half the cost of the regular hand grubbing methods. 1946 results were so encouraging that six mobile power spray units are planned for 1947, and an appraisal is now being conducted to ascertain the extent of the sugar pine area that can be treated more effectively by chemical methods than by hand grubbing.

There are several species of ribes that are somewhat resistent to 2,4-D or that require a heavy dosage. However, the fact that 2,4-D is so effective on the Sierra gooseberry is a fortunate circumstance. This gooseberry constitutes over nine-tenths of the ribes in the sugar pine belt and is by far the most troublesome species to suppress. It is the ribes that comes in most prolifically on logged areas, and will almost invariably occur at its best in top quality sugar pine sites. In such sites it is not uncommon to find concentrations of several thousand plants per acre. It is in such spots that chemical eradication will pay biggest dividends. Moreover, there will need be no soil disturbance with chemical eradication as contrasted with grubbing methods, where the soil is pretty thoroughly churned over with a resultant heavy germination of ribes seed.

2. Contracting Ribes Eradication

As a result of experimental work in contracting small parcels of land to private contractors in 1946, it was apparent that this procedure possesses real possibilities in speeding up work and lowering costs. The job of eradicating ribes is monotonous at best, and with regular hired labor there is no incentive for rapid movement of workers in systematically covering a forest area searching for ribes. The contract method provides this incentive. As contractors gain experience we can expect an increasing percentage of the eradication job to be handled in this manner. Competition among contractors should lower costs. Contract work should pay biggest dividends in areas of light ribes populations where a high percentage of the time is spent in searching.

Spread of the Rust

1946 was another year unfavorable for rust spread, and no new advances on ribes were noted in the Region. Pine infection, however, was found for the first time on the Tahoe and Eldorado National Forests. The Eldorado infection represents a southward advance of the rust on sugar pine in the Sierra Nevada of 39 miles to a point now 204 air line miles south of the Oregon boundary. Additional pine infection centers were found within the general zone in which the rust had previously spread. In a few localities, especially in the Klamath region of northwestern California, rust intensification is taking place at an extremely rapid rate with local spots of severe pine damage. Over most of the infection zone in the Sierra Nevada, however, the rust is developing slowly and at a rate below expectations.

Classification of Sugar Pine Lands

A phase of control work receiving special attention during 1946, participated in jointly by members of the Forest Service, the Forest Experiment Station, and by members of the Blister Rust Control office of Entomology and Plant Quarantine has been the development of a procedure for classification of sugar pine lands based on the capacity of the land to produce sugar pine. Numbers and distribution of sugar pine trees by size classes and site determinations are the two principal yardsticks used in making the classification. Four groupings are used. The object is to segregate the sugar pine type into areas of rated groupings to guide control forces and forest administrators in the order in which control work should be applied. In effect it establishes a priority order of treatment. In the event facilities are not available to protect all pine area set up in control units, the best pine growing lands will not be overlooked and losses will fall to the less valuable lands.

The Problem of Sugar Pine Regeneration

The accelerated logging of the war years, which has continued to the present, has brought into sharp focus a special problem facing control forces, and facing all agencies interested in the future of sugar pine—the problem of forest management, of silvicultural treatment of the area aimed to insure a continuation of the sugar pine crop. Control effort cannot intelligently be expended where there is no way of foretelling how much pine, if any, may result from present cutting practices. Experience has shown that to initiate ribes eradication work shortly before or after logging, on areas where there is no assurance pine reproducton will come in, represents a big gamble. We are thus now being more critical of cut-over areas and placing in a deferred status those areas that are not reproducing satisfactorily to sugar pine.

It is evident that there is yet too little conscious effort to manage for sugar pine and that without studied effort there will not be a satisfactory come-back of sugar pine on some areas. This situation illustrates and emphasizes the need for more research in the silviculture of sugar pine and in sugar pine management. This research should, among other things, determine proper cutting practices to be used in the sugar pine types to induce adequate sugar pine reproduction, and also, how artifically to establish sugar pine in the better pine sites not now adequately stocked.

PART II

LEADERSHIP, COORDINATION, AND TECHNICAL DIRECTION OF BLISTER RUST CONTROL BY THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

Work Project BLR-1-5

By

Conrad P. Wessela, Forester, P-4

PURPOSE

Blister-rust-control work is conducted by several Federal agencies each on lands within its jurisdiction. To direct these projects toward common national objectives, Congress has vested the Bureau of Entomology and Plant Quarantine with responsibility for the leadership, the coordination, and the technical direction of all control work.

ORGANIZATION

The regional headquarters of the Bureau at Oakland, California, carried out the purposes of this project within the Pacific Coast Region through its technical staff. Staff members devised plans for the 1946 season through consultation with cooperating agencies, provided assistance and technical advice on control problems, and coordinated the work of the several agencies toward Regional objectives.

Staff of the Oakland Regional Office in 1946

Warren V. Benedict, Forester, P-5 . . . . Regional Leader in Charge
Thomas H. Harris, Forester, P-4 . . . . Assistant Regional Leader

Control Operations

a. Oregon and Klamath National Forest of California

Conrad P. Wessela, Forester, P-4. . . . . Operation Supervisor
Lyle N. Anderson, Agent, P-2. . . . . . . Assistant Operation Supv.
Homer R. Bryan, Field Asst., SP-7 . . . . Assistant Operation Supv. (Appointment effective December 1, 1946)

b. Lassen and Plumas National Forests, Lassen Volcanic National Park

Benton Howard, Forester, P-4. . . . . . . Operation Supervisor
S. Daryl Adams, Agent, P-2. . . . . Assistant Operation Supv. (Returned from military furlough February 1, 1946)
E. Ross Ellis, Agent, P-2 . . . . Assistant Operation Supv.
Dwight L. Westberg, Field Asst., SP-7 . . Checking Supervisor (Appointment effective December 1, 1946)
Alden J. Thompson, Field Asst., SP-7. . . Camp Superintendent (Appointment effective December 1, 1946)

c. Eldorado and Stanislaus National Forests

Roy Blomstrom, Forester, P-4	Operation Supervisor (Returned from military furlough February 1, 1946)
Robert Sovulewski, Agent, P-3	Assistant Operation Supv.
Carl W. Fowler, Forester, P-3	Assistant Operation Supv.
R. Riggs Johnston, Field Asst., SP-7 .	Checking Supervisor

d. Sierra National Forest, Yosemite and Sequoia-Kings Canyon National Parks

Frank A. Patty, Pathologist, P-3 . . .	Operation Supervisor
John N. Mitchell, Forester, P-2 . . .	Assistant Operation Supv.

e. Southern Sierra

Arthur London, Forester, P-3	Operation Supervisor (Promotion and transfer from Forest Service effective October 22, 1946)

Reconnaissance, Scouting, and Disease Surveys

Douglas R. Miller, Pathologist, P-3. .	Project Leader

Education and Information

John C. Crowell, Agent, P-2	Informational Specialist (Returned from military furlough September 9, 1946)

Chemical Eradication - (Power Spray Project)

Lawrence P. Winslow	Agent, P-3 (Forest Ecologist) (Promotion and transfer from Methods Development Project effective December 2, 1946)
Warren S. Burrill	Pathologist, P-2

Business Administration

Paul A. Auge	Administrative Asst., CAF-9
Orvis R. Decious	Administrative Asst., CAF-7
Aretta D. Miller	Clerk-Stenographer, CAF-5
Juliana Arca	Clerk, CAF-5
Francis Hall	Clerk, CAF-4 (Appointed May 27, 1946)
Marion A. Bruun	Clerk, CAF-4
Roberta J. Bruun	Clerk-Stenographer, CAF-3

Business Administration (Continued)

Minnie E. Groshong	Clerk-Stenographer, CAF-3 (Appointed by transfer August 26, 1946)
Mabel L. Louie	Clerk-Typist, CAF-3 (Extended LWOP effective November 26, 1946)
Mabel E. Rothe	Clerk-Stenographer, CAF-3
Hulda A. Penn	Clerk-Typist, CAF-2 (Resigned April 26, 1946)
Shirley W. Rieger	Clerk-Typist, CAF-2 (Temporary appointment effective December 9, 1946)
Willard N. Porter	Clerk, CAF-2
Richard F. Leahy	Storekeeper, CAF-6
William R. Nordin	Automobile Mechanic, CPC-7 (Deceased August 6, 1946)

In addition an average of three seasonal clerk-typists were employed for the peak load of the summer.

Development and Improvement of Methods for the Far Western Regions

Harold R. Offord	Senior Pathologist, P-5, In Charge

Berkeley, California, Office

Clarence R. Quick	Forest Ecologist, P-3
Lawrence P. Winslow	Agent, P-2 (Transferred to Oakland Regional Office December 2, 1946)
Catherine Ryan	Clerk-Stenographer, CAF-3

Spokane, Washington, Office

Virgil D. Moss	Forest Ecologist, P-3
John F. Breakey	Pathologist, P-2
Charles R. Stillinger	Pathologist, P-2
Richard T. Bingham	Agent, P-2 (Transferred from Control Project June 30, 1946)

Rates of Pay

Classified

Pay Roll Title	Field Title	Before July 1-Per Annum Rate	After July 1-Per Annum Rate	Hourly Overtime Rate Before July 1	Hourly Overtime Rate After July 1
Field Supv., SP-7	Camp Supt.	$2,650.00	$3,021.00	$1.91	$2.14
Field Supv., SP-6	Foreman	2,320.00	2,644.80	1.67	1.90
Field Supv., SP-5	Asst. Foreman	2,100.00	2,394.00	1.51	1.72

Pay Roll Title	Field Title	Before July 1-Per Annum Rate	After July 1-Per Annum Rate	Hourly Overtime Rate Before July 1	After July 1
Field Supv., SP-5	Asst. to Oper. Supervisor	$2,100.00	$2,394.00	$1.51	$1.72
Inspector, SP-7	Checker Foreman	2,650.00	3,021.00	1.91	2.14
Inspector, SP-6	Senior Checker	2,320.00	2,644.80	1.67	1.90
Inspector, SP-5	Junior Checker	2,100.00	2,394.00	1.51	1.72
Clerk, CAF-3	Camp Clerk	1,902.00	2,168.28	1.37	1.56

Unclassified

Pay Roll Title	Field Title	Per Annum Rate	Basic Hourly Rate	Biweekly Gross Earnings	Hourly Overtime Rate
Cook, Unallocated	Cook, first	$2,562.00	$1.23	$98.53	$1.84
Cook, Unallocated	Cook, second	2,320.00	1.11	89.23	1.67
Cook, Unallocated	Cook, small camp	2,034.00	.97	78.23	1.46
Laborer	Crewleader	2,034.00	.97	78.23	1.46
Laborer	Crewman or Flunky	1,836.00	.88	70.61	1.32
Laborer	Truck driver (2 ton and under)	2,100.00	1.01	80.77	1.51
Laborer	Strawboss	2,100.00	1.01	80.77	1.51

WORK PERFORMED

Leadership and Coordination

The Bureau provided the necessary planning and technical direction to coordinate the white pine blister-rust-control programs of the following agencies, all of which engaged in or contributed to the 1946 control activities.

1. Agencies engaged in control work.

    a. United States Department of Agriculture

        (1) Bureau of Entomology and Plant Quarantine
        (2) Forest Service

    b. United States Department of the Interior

        (1) National Park Service
        (2) Oregon and California Revested Lands Administration

2. Non-Federal agencies participating financially in the cooperative control project.

    a. State of California (Division of Forestry, Department of Natural Resources). Appropriations have been made since 1941. The one for the biennium July 1, 1945 to June 30, 1947 is $150,000.

b. Diamond Match Company. Since 1942 the company has made a yearly contribution of $2,000.

c. Michigan-California Lumber Company. Since 1942 the company has made a yearly contribution of $2,000.

d. Winton Lumber Company. The company entered the project with a contribution of $1,000 for fiscal year 1946 and has again contributed $1,000 for fiscal year 1947.

3. Agencies contributing facilities and services under Memoranda of Agreement with the Bureau of Entomology and Plant Quarantine.

a. State of California

(1) Department of Agriculture
(2) College of Agriculture, University of California
(3) Botanical Gardens, University of California

b. State of Oregon

(1) Oregon State Board of Forestry
(2) Division of Plant Industry, Department of Agriculture

Funds contributed by the State of California and by the above-named lumber companies were matched dollar for dollar by Federal funds as authorized by the Lea Act of 1940, and were expended on the cooperative project for control work on private and state lands.

The Memoranda of Agreement (or Understanding) defining the relationships and responsibilities between the Bureau and the cooperating Federal agencies, states, and privately owned lumber companies were continued in effect through 1946.

A leading responsibility of the Bureau was the recruitment of qualified labor and temporary field supervisors, not only for the cooperative project but also in differing degree for the projects of the Federal agencies. On eradication projects it was again necessary to rely mainly on students of high school age. Adult laborers and men qualified for temporary supervisory positions were generally unwilling to accept such temporary employment. However, the quality of labor obtained during the season was slightly better than that obtained during the previous three years, owing largely to the employment of a few more adult laborers. The lack of competent temporary supervisors still remained a major problem on most operations.

Recruiting activities by the Bureau were started in March in all colleges and universities in California, in the major universities and colleges west of the Mississippi River, and in all forestry schools throughout the United States. Few men were obtained from these sources. With the assistance of the United States Employment Service most men hired came from the high schools of the San Francisco Bay Region and from Southern California. Some high school students were also obtained from the Mid-west, and they proved to be above average in quality. The Bureau secured workers and temporary supervisors for the U. S. Forest Service projects on the Eldorado and Stanislaus National Forests, and with the exception of field

supervisors recruited all men for National Park Service projects in California. Some recruiting assistance was also given the Klamath and Rogue River National Forests, and the Oregon and California Revested Lands Administration projects.

The Bureau in its capacity of providing overall leadership and technical direction for the entire blister-rust-control program carried on several projects at the Oakland, California headquarters prior to the start of the 1946 field season. Some of the more important were as follows:

1. One of the pressing problems in the control of white pine blister rust is the selection of stands of sugar pine to be protected and their arrangement in a priority order. For some time a staff committee had been devising a method to help solve this problem, and in 1946 the committee recommendations were embodied in a report written by Mr. Robert Sovulewski, Agent, and Mr. T. H. Harris, Forester, and entitled, "A Method for the Classification of Sugar Pine Land According to Expected Yield". The method aims at ascertaining roughly the productivity of sugar-pine-growing land by forecasting yield from sugar pine stocking figures as influenced by timber site. The objective is the classification of sugar pine land into four broad yield groups defined by board foot limits of sugar pine per acre without the necessity of duplicating earlier field work. The task of classifying all sugar pine lands into these four broad yield groups and their arrangement in a priority order is now underway.

2. The Bureau maintains a considerable volume of records pertaining to all phases of the blister-rust-control program at its Regional Office. To make certain these records and related data are used to the fullest extent, to study the advisability of devising a central system of record keeping, and to study the need for and use of more complete written histories of the progress of control work by control units, a staff committee was appointed to study the entire record keeping procedure. When this study was completed a report presenting a summary of present records and recommending changes in methods of maintaining and filing them was submitted to the Regional Leader.

3. In the field of public relations the preparation of a scenario for a moving picture was undertaken by Mrs. Ruth Newton of The Motion Picture Service of the Department of Agriculture.

4. To coincide more thoroughly with the method of classifying sugar pine lands described under #1, above, a new reconnaissance manual setting forth methods of conducting preliminary surveys of sugar pine land was written and distributed for field use.

5. In line with the general accident prevention program initiated by all Federal agencies, a detailed analysis was made of all accidents to Bureau employees from 1942 through 1945. This analysis provided a sound background for a current safety program in blister-rust-control work. Accidents during the 1946 field season will be reviewed during the winter for possible leads for improving next season's safety program.

6. Considerable study and discussion on how to treat in eradication practice brush fields and southerly slopes supporting predominantly ponderosa pine, where such areas are not large enough to eliminate from control

units, resulted in the preparation of a policy statement. Briefly, dry south-facing slopes of not less than 40 acres supporting largely ponderosa pine are not given over-all coverage. Only streams, draws, and those portions of these slopes supporting 50 or more ribes per acre receive eradicative treatment. Similar treatment of brush fields was initiated. Brush fields of greater than 80 acres are not worked except for a narrow belt of two or three chains around the perimeter.

Technical Direction of Ribes Eradication

On all active operations the Bureau provided a technical staff to advise, coordinate, inspect, and to render assistance in the actual operation of cooperating agency blister-rust-control programs. On the Siskiyou National Forest in Oregon and on the Eldorado, Stanislaus, and Sierra National Forests in California the Bureau's technical staff supervised blister-rust-control camps and field work at the request of the Forest Service.

Within the limits of effective administration ribes eradication work was concentrated in those portions of the Region where white pine blister rust infection was most prevalent or where the danger of rust becoming established in the near future was greatest. The spot-working and canker-removal measures adopted during the war years to delay rust spread were continued to some extent, but, in general, emphasis was placed on preventive treatment of larger blocks of the best sugar pine sites and in particular of those areas where reeradication work was urgent.

One outstanding development during 1946 has been the real promise shown by the use of 2,4-D in solving the problem of eradicating dense populations of Ribes roezli. As a result of 1945 experiments, application of the ribicide 2,4-D with power spraying equipment was given extensive field tests in 1946 to determine the toxicity of the various 2,4-D compounds on a practical working basis and to compare the cost with hand and mechanical methods of eradication. These tests show that as a killing agent for R. roezli to be used on a practical working basis, 2,4-D comes nearer to being the perfect ribicide than any chemical tried thus far. Furthermore, the mechanical application of 2,4-D to the dense populations of R. roezli commonly found on logged lands in California shows definite promise of substantial savings in cost over hand or mechanical methods. Data and experience are not yet sufficiently complete to state definitely the amount of these savings, but present indications are that control may be established at one third the cost of hand or mechanical methods on areas supporting 500 or more ribes per acre. As the density of the ribes population increases the savings effected by using 2,4-D with power spraying equipment tend to increase, and, conversely, the sparser the ribes population becomes the less the savings effected. Just where the cost of spraying 2,4-D will equal the cost of hand eradication is still unknown, but it seems likely to be in a ribes population of 100 to 200 per acre. There are, of course, many limiting factors in the use of 2,4-D such as accessibility, water supplies, etc., and because of these limiting factors and the vast territory supporting light populations of ribes in the Region the use of 2,4-D offers no panacea for the whole of the control problem. Hand eradication still remains the principal means of removing ribes, but 2,4-D does provide a means of measurably reducing control costs as a whole because of the comparative ease with which accessible, heavy concentrations of Ribes roezli may be eradicated. Furthermore the application of 2,4-D concentrates with special

devices to be used by hand eradicators as a supplement to digging appears to hold promise of reducing costs still further. A detailed analysis of the extensive field tests made with 2,4-D is reported in Part IX of this report.

Another development worthy of mention is that of contracting ribes eradication work to private individuals. As an experiment, two small contracts for reeradication work on 110 and 60 acres each were awarded on the Rogue River National Forest in Oregon. Invitations for competitive bidding were issued on U. S. Standard Form 33 (Revised). Articles of the contracts were as follows:

> To perform all labor and furnish all transportation and supplies, except as designated below, necessary for the eradication of ribes (gooseberries and currants) for the control of the white pine blister rust disease upon an area shown on the attached map and more specifically designated on the ground.
>
> The Forest Service will provide successful bidder with the number of ribes-eradication picks and the amount of twine needed, one 14'x16' or 16'x16' tent and one camp stove.
>
> Penalty for Cutting off Ribes at the Crown
>
> The penalty for cutting off ribes at the crown and not removing those crowns from the soil will be forfeiture of payment for (4) four acres of worked area for each crown or portion of the crown found attached to roots in the soil.
>
> All work will be done in accordance with attached specifications. Eradication of ribes from ________ acres by hand pulling and digging methods $________.
> per acre
>
> The acreage shown is based upon actual measurement and payment will be made upon the basis of measurement by Forest Officer of the actual area upon which work is done, which may be 10 per cent more or less than the amount stated.
>
> Partial payment will be made upon submission of properly certified vouchers for not less than 40 acres from which ribes have been eradicated according to specifications, but not oftener than bimonthly and at termination of contract.
>
> General conditions applicable to Service contracts, maps, and specifications attached hereto are part of this invitation and contractor will be bound thereby.

Specifications attached to the invitations to bid read as follows:

DEFINITIONS:

Ribes - In the uncapitalized form a collective name applied to plants of the genus ribes, comprising the currants and gooseberries.

Ribes Eradication - The removal by the roots of ribes from stands of white or five-needled pines for protection against white pine blister rust.

Ribes Feet of Live Stem (FLS) - The living stem and branches of a ribes plant measured in linear feet as though all the branches were torn apart and placed end to end.

Crown - That portion of the ribes plant found at the junction of the stems and roots.

Worked Area - Area on which ribes eradication work has been performed.

Check - A systematic sampling of worked area for the purpose of ascertaining the number, size, and distribution of the ribes missed and remaining on the worked area, which information indicates whether or not the eradication job meets prescribed specifications.

Rework - When the work performed during a ribes eradication job has not been thorough enough to meet prescribed specifications those portions failing to meet the specifications are reworked until they do. This additional work is done immediately after a check, as needed, and is known as rework.

STANDARDS OF WORK:

1. The entire crown and at least the first six (6) inches of the roots below the crown of each ribes will be removed from the soil.

2. If the stems of a ribes plant break from the crown in the process of eradicating it, the stems and the dug or pulled crown and roots will be piled together.

3. The hole left in the soil as a result of eradicating a ribes will be left open for inspection.

4. Eradicated ribes will be left near the point from which they were dug or pulled.

5. On moist ground near streams and swamps, eradicated ribes will be hung on trees, logs or other dry spots and not thrown upon moist ground or into streams.

6. A count will be kept of all ribes eradicated and this information made available to the Forest Service officer in charge.

7. The ribes feet of live stem will be reduced to an average of not over eight (8) feet per acre on units of 40 acres and no one ribes plant of more than three (3) feet of live stem may be left on any worked area. Designated Forest Officers will check worked area and those portions where the ribes

live stem has not been reduced to these specifications will be designated for rework until live stem and plant size specifications are fulfilled.

Low bids on the two contracts averaged $10.59 per acre. Although it was realized that the bids were high, the contracts were awarded at that price because of the experimental nature of the project and also to create interest among individuals qualified for contracting. Results were entirely satisfactory in all respects. A total of 170 acres was worked to specifications by contractors with an expenditure of 45 eight-hour man days. Considerable local interest has been aroused, and future competitive bidding should result in lowering costs well below those entailed by the use of day labor. More experimentation with contracting will be done during the 1947 season. Size of areas contracted will be kept small in order to keep them within the capabilities of the average conscientious laborer or small groups of laborers working as partners.

A departure from standardized crew formations in hand eradication has been used successfully during the 1945 and 1946 seasons by its originators on the Sierra National Forest and Yosemite National Park. For some years the standard practice in ribes eradication work has been to assign each 3-man crew a separate block of about 20 to 80 acres which the crew works alone. As an alternative the new method groups several 3-man crews side by side in a so-called gang formation in a larger block. As the group of crews proceeds forward abreast the third member of each crew, except the outside crew, drags a string about 100 feet long, this being sufficient to separate the strips of the several crews working in a group. The third member of the last crew lays down a continuous string line as done formerly. This continuous string marks the boundary of the group's strip and provides the guide line for the return strip run by the group. To eliminate the disadvantage of the slowest crew holding back the group and to provide for uniform good quality of work, one crew termed the "swing crew" is employed. The swing crew has no fixed assignment, its function being to work in any strip which will keep the line of crews balanced and progressing most effectively. At the direction of the foreman, the swing crew enters the work of a lagging crew, or, when not required to balance the line he may have them check behind the line crews to insure that the work done is satisfactory.

This group formation with swing crew method developed out of necessity because of the use of young and totally inexperienced crewmen. The originators of the method hold that the advantage of continuous supervision permitted by the method more than offsets the disadvantages. Furthermore, a saving of about 70 per cent in twine is effected.

Checking

One of the important functions of the Bureau in providing technical direction to the whole blister-rust-control program is that of checking. Checking is the systematic inspection of ribes conditions on an area by strip sampling to obtain a reliable estimate of the distribution, the number, and the feet of live stem of ribes on that area.

There are three general classes of checking:

Regular checking is the inspection of all areas worked by eradication crews. Its purpose is to indicate to what degree the standard of control has been reached.

Advance checking is the inspection of areas before ribes eradication in order to obtain information on the occurrence of ribes, from which the most effective eradication can be planned. By means of an advance check those areas that are very low in ribes populations may be eliminated from crew work.

Post checking is the inspection of areas two or more years after ribes eradication for the purpose of determining the status of control.

As in previous years, working agreements between the Bureau and other Federal agencies arranged for the performance of checking work on their projects and also permitted the employment of all checkers by the Bureau. Other Federal agencies reimbursed the Bureau for the salaries of checkers assigned to their projects. Under this system the Bureau was wholly responsible for all checking work. A total of 103 checkers were employed in the Region. About sixty per cent of these were college students or college graduates and a high percentage were veterans. In general the performance of all checkers showed marked improvement over that shown during the war years.

Summaries of the checking work appear at appropriate places elsewhere in this report.

Preliminary Surveys

In line with the system of classifying sugar pine lands into productivity groups described previously in this report, the Bureau placed four 6 to 8-man reconnaissance crews in the field during 1946 to perform preliminary surveys on sugar pine lands not previously appraised. In addition to ascertaining the sugar pine productivity of areas covered, these surveys provide sufficient information to determine the approximate cost of establishing blister rust control.

Working agreements between the Bureau and the other Federal agencies engaged in blister-rust-control work permit the Bureau to perform preliminary surveys on all lands regardless of ownership. Cost of the work is borne by the agencies having jurisdiction over the lands covered, with the Bureau standing the cost for coverage of state and privately owned lands.

This project is reported and summarized in detail in Part VIII.

Scouting for Blister Rust and Disease Surveys

This project is reported and summarized in detail in Part VII.

FINANCIAL STATEMENTS

The 1946 calendar year control program was carried on in the Pacific Coast Region from regular Congressional appropriations to the Bureau and cooperating Federal agencies together with the State of California and private cooperators' cash contributions.

In financial Table 1 are shown the allotments made to the cooperating Federal agencies for expenditure in the Pacific Coast Region for the 1946

and 1947 fiscal years. Financial Table 2 shows the expenditures by the same agencies for the 1946 calendar year.

Financial Table 3 pertains only to expenditures of this Bureau and shows expenditures by project and appropriation symbol, and by State separated to show amounts expended for salaries and wages, and for other expenses. The amounts shown as salaries are the net payments after deductions for subsistence from the earnings of the employees. The cost of subsistence supplies is included under "Expenses". Also included as a part of this table are the expenditures of the Developmental and Investigative Unit headquartered at Berkeley, whose bookkeeping records are maintained and vouchers processed through the Oakland Regional Office. The expenditures of the Berkeley Unit include the salaries, expenses, and operating costs of three of its personnel headquartered at the Northwestern Regional Office at Spokane, Washington and one stationed at Moscow, Idaho.

Financial Table 4 (also shown as Table 7, page 60) shows the amounts contributed in cash by the State of California and the four cooperating lumber companies for ribes eradication in California and the amounts allocated by the Federal Government for the purpose of matching such contributions under the provisions of the "Lea Act", Public Law 486, 76th Congress. This table also shows the accumulative expenditures from "Lea Act" funds from July 1, 1941 through December 31, 1945; such expenditures during the period January 1 to December 31, 1946, and the balances available for expenditure as of January 1, 1947. The available Federal funds must be expended prior to July 1, 1947; the cash contributions from State and private sources remain available until expended.

Omnibus Table 4 presents a summary of expenditures for 1946.

TABLE 1

FISCAL YEAR ALLOTMENTS FROM WHICH FEDERAL EXPENDITURES WERE MADE IN THE PACIFIC COAST REGION DURING THE CALENDAR YEAR 1946

ALL REGULAR FUNDS

Agency	Fiscal Year 1946	Fiscal Year 1947*
Bureau of Entomology and Plant Quarantine	$ 366,375	$ 703,000
Forest Service, Region 5 (California).	322,616	816,000
Forest Service, Region 6 (Oregon).	78,984	113,039
National Park Service:		
Yosemite National Park	106,021	125,000
Sequoia-Kings Canyon National Park	30,500	50,000
Regional Office.	7,120	18,018
Oregon and California Revested Lands Administration	79,430	165,000
Total - Pacific Coast Region	$ 991,046	$ 1,990,057

*Figures in this column represent allotments as they are known as of December 31, 1946, and are subject to change until June 30, 1947.

TABLE 2

FEDERAL EXPENDITURES IN THE PACIFIC COAST REGION FOR THE CALENDAR YEAR 1946

REGULAR FUNDS

Agency	California Fiscal Year 1946 1/1/46-6/30/46	California Fiscal Year 1947 7/1/46-12/31/46	Oregon Fiscal Year 1946 1/1/46-6/30/46	Oregon Fiscal Year 1947 7/1/46-12/31/46	Region Total
Bureau of Entomology and Plant Quarantine	$ 161,560	$ 367,194	$ 3,976	$ 5,029	$ 537,759
Forest Service, Region V	129,768	408,642			538,410
Forest Service, Region VI			24,719	58,266	82,985
National Park Service:					
Yosemite National Park	42,980	108,988			151,968
Sequoia-Kings Canyon National Park	6,307	35,165			41,472
Regional Office	4,652	3,018			7,670
Oregon and California Revested Lands Administration			28,083	81,831	109,914
Total - Pacific Coast Region. . .	$ 345,267	$ 923,006	$ 56,778	$ 145,126	$ 1,470,178

TABLE 3

CLASSIFIED BUREAU EXPENDITURES BY STATE, APPROPRIATION SYMBOL, AND PROJECT

Pacific Coast Region - January 1 to December 31, 1946

Appropriation Symbol	Fiscal Year 1946 1262245(66).003		Fiscal Year 1947 1272245(66).003		12X8200(13).213*				
Project No.	3101.14	3103.14	3101.14	3103.14	X2132.14	X2133.14	X2134.14	X2136.14	Total
California									
Salaries	$36,309.19	$ 48,465.25	$46,447.70	$219,106.64	$52,540.93	$1,854.83	$689.14	$1,000.00	$406,413.68
Expenses	10,478.77	66,307.10	10,879.72	90,759.54	24,587.06	324.72	200.00		203,536.91
Totals	$46,787.96	$114,772.35	$57,327.42	$309,866.18	$77,127.99	$2,179.55	$889.14	$1,000.00	$609,950.59
Oregon									
Salaries	$ 3,872.52		$ 4,487.05						$ 8,359.57
Expenses	103.90		541.91						645.81
Totals	$ 3,976.42		$ 5,028.96						$ 9,005.38
Pacific Coast Region									
Salaries	$40,181.71	$ 48,465.25	$50,934.75	$219,106.64	$52,540.93	$1,854.83	$689.14	$1,000.00	$414,773.25
Expenses	10,582.67	66,307.10	11,421.63	90,759.54	24,587.06	324.72	200.00		204,182.72
Totals	$50,764.38	$114,772.35	$62,356.38	$309,866.18	$77,127.99	$2,179.55	$889.14	$1,000.00	$618,955.97

*Contributed cooperative funds: X2132.14 State of California, Division of Forestry $75,000; X2133.14 The Diamond Match Company $2,000; X2134.14 Michigan-California Lumber Company $2,000; X2136.14 The Winton Lumber Company $1,000, from which no expenditures were made during the calendar year.

D & I Unit**

Salaries	$12,772.67		$16,259.50						$ 29,032.17
Expenses	2,094.27		849.85						2,944.12
Totals	$14,866.94		$17,109.35						$ 31,976.29

**Amounts shown in these columns represent expenditures of the Development and Investigative Unit headquartered at Berkeley from funds allocated directly to that Unit, but whose accounts and vouchers were processed by the Oakland office.

TABLE 4

STATUS OF COOPERATIVE FUNDS FOR RIBES ERADICATION ON STATE AND PRIVATE LANDS
IN CALIFORNIA - JULY 1, 1941 TO DECEMBER 31, 1946

Cooperative Funds	Accumulative Cooperative Contributions and Federal Appropriations 7/1/41-6/30/47	Accumulative Expenditures 7/1/41-12/31/45	Expenditures Calendar Year 1946	Available Balances as of 1/1/47
State and Private Cash Contributions:				
State of California	$ 300,000	$147,191	$ 77,128	$ 75,681
Diamond Match Co.	10,000	6,052	2,180	1,768
Michigan-California Lumber Co.	10,000	7,057	889	2,054
Red River Lumber Co.*	4,000	4,000		
Winton Lumber Co.	2,000		1,000	1,000
Total	$ 326,000	$164,300	$ 81,197	$ 80,503
Federal Allotments (Project 3103.14)				
1942 Fiscal Year	$ 14,625	$ 14,612		
1943 Fiscal Year	71,770	71,378		
1944 Fiscal Year	86,195	86,083		
1945 Fiscal Year	85,040	84,997		
1946 Fiscal Year	271,125	155,772	$114,772	
1947 Fiscal Year	583,000*		309,866	$273,134
Total (Project 3103.14)	$1,111,755	$412,842	$424,638	$273,134
Grand Total	$1,437,755	$577,142	$505,835	$353,637

*Red River Lumber Company contributed only for 1943 and 1944 fiscal years.

NOTE: Expenditures in the amount of $51,032.97 were made during 1946 for emergency fire suppression at the call of the State of California, Division of Forestry, and the U. S. Forest Service. Reimbursements were made by these agencies to the Bureau blister-rust-control funds in the amount of $15,732.66 from the State of California and $35,300.31 from the Forest Service. These amounts were credited back to the funds from which expended and are a part of the balances shown available for expenditure.

***$120,000 of this amount allotted for working of intermingled lands in state and private ownership.**

TABLE 5
(Omnibus Table 4, Sheets 1 and 2)

SUMMARY OF EXPENDITURES - FEDERAL AND COOPERATIVE - 1946

State	Cooperative Funds			Total Federal Funds	Total All Funds	Federal Funds				
	Total (Direct and Indirect Aid)	Indirect Aid	Direct Aid			Entomology and Plant Quarantine		Forest Service	Park Service	O & C
						3101	3103			
California	$91,397	$10,200	$81,197	$1,268,274	$1,359,671	$104,115	$424,639	$538,410	$201,110	
Oregon	1,000	1,000		201,904	202,904	9,005		82,985		$109,914
Totals	$92,397	$11,200	$81,197	$1,470,178	$1,562,575	$113,120	$424,639	$621,395	$201,110	$109,914

State	Cooperative Funds Direct Aid			Expenditures* Chargeable to Ribes Eradication	Average Cost**	
	State	Private	Total		Per Acre	Per Effective Man Day
California	$77,128	$4,069	$81,197	$1,245,356	$15.91	$18.98
Oregon				192,899	17.52	19.36
Totals	$77,128	$4,069	$81,197	$1,438,255	$16.11	$19.03

*Includes only Bureau 3103, Cooperative Direct Aid, all other Federal agency expenditures listed in table above.

**Acreage and Effective Man Days used in computations are shown in Table 3, Part II.

See Table 2, Part I, for average cost figures by agencies.

TABLE 6
(Omnibus Table F - Sheets 1 and 2)

SUMMARY OF EXPENDITURES FEDERAL AND COOPERATIVE - 1918*-1946

(Gross Figures Used)

State	Total Federal Funds		Total Cooperative Funds	Grand Total All Funds	Regular Funds			
	Regular	Emergency			Bureau (BPI & EPQ)	Forest Service	Park Service	O & C Revested Lands
California	$4,616,057	$3,449,752	$575,797	$ 8,641,606	$1,840,355	$2,181,093	$594,609	
Oregon	910,349	598,888	187,300	1,696,537	305,334	320,255		$284,760
Totals	$5,526,406	$4,048,640	$763,097	$10,338,143	$2,145,689	$2,501,348	$594,609	$284,760

State	Direct Aid			Indirect Aid	Total Cooperative Funds
	State	Private	Total		
California	$224,319	$21,178	$245,497	$330,300	$575,797
Oregon				187,300	187,300
Totals	$224,319	$21,178	$245,497	$517,600	$763,097

*No expenditures in the Pacific Coast Region prior to 1923.

TABLE 7

EXPENDITURES BY AGENCIES AS OF DECEMBER 31, 1946
FOR RIBES ERADICATION WORK

Agency	Type of Funds	Amount By Type Of Funds	Total Expenditures
U. S. Forest Service	Regular	$2,501,348	$3,507,658
	WPA	509,542	
	CCC	219,841	
	PWA	276,927	
National Park Service	Regular	594,609	793,322
	CCC	198,713	
O & C Rev. Lands Administration	Regular	284,760	284,760
Bureau*	Regular	1,085,949	3,607,801
	WPA (Fed.)	2,145,988	
	WPA (State)	20,666	
	PWA	352,692	
	NYA	2,506	
Total Federal			8,193,541
State of California			224,319
Private Lumber Companies			21,178
Total Expenditures			$8,439,038

*In addition to Bureau expenditures for ribes eradication work $1,381,505 have been expended for other activities such as leadership, coordination, and technical direction of the general control program, disease surveys and scouting, black currant eradication, and pine reconnaissance. Of this total $1,059,740 was regular funds, $188,512 WPA funds, and $133,253 PWA funds.

REGIONAL SUMMARY TABLES

OF

RIBES ERADICATION AND OF CHECKING

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TABLE 1

THE STATUS OF RIBES ERADICATION IN THE PACIFIC COAST REGION AS OF DECEMBER 31, 1946

PART A - CALIFORNIA

Control Operation	Class of Ownership	Control Units		Status of Ribes Eradication								
				First Working			Reeradication			Total All Workings		
		Total Acres	Acres Unworked	Acres Worked	Man Days	Ribes Eradicated	Acres Worked	Man Days	Ribes Eradicated	Acres Worked	Man Days	Ribes Eradicated
National Forests												
Mendocino	Federal	21,017	21,017									
	Private	15,179	15,179									
	State	48	48									
	Total -	36,244	36,244									
Trinity	Federal	122,575	122,575									
	Private	40,283	40,283									
	State	2,088	2,088									
	Total -	164,946	164,946									
Klamath	Federal	19,650	11,420	8,230	8,549	1,049,574	3,823	4,016	185,179	12,053	12,565	1,234,753
	Private	26,850	7,820	19,030	19,564	1,600,292	6,366	5,585	105,904	25,396	25,149	1,706,196
	Total -	46,500	19,240	27,260	28,113	2,649,866	10,189	9,601	291,083	37,449	37,714	2,940,949
Shasta	Federal	3,611	3,611									
	Private	74,151	74,151									
	Total -	77,762	77,762									
Lassen	Federal	69,172	55,939	13,233	8,059	1,542,268	3,122	1,362	107,708	16,355	9,421	1,649,976
	Private	243,921	195,114	48,807	33,762	4,929,342	21,678	8,339	994,324	70,485	42,101	5,923,666
	State	1,055	1,055									
	Total -	314,148	252,108	62,040	41,821	6,471,610	24,800	9,701	1,102,032	86,840	51,522	7,573,642
Plumas	Federal	186,585	99,356	87,229	66,297	12,596,994	48,453	29,265	3,104,167	135,682	95,562	15,701,161
	Private	125,630	49,472	76,158	61,577	12,335,385	47,220	27,183	3,465,250	123,378	88,760	15,800,635
	State	360	320	40	21	4,620				40	21	4,620
	Total -	312,575	149,148	163,427	127,895	24,936,999	95,673	56,448	6,569,417	259,100	184,343	31,506,416
Tahoe	Federal	19,925	19,925									
	Private	19,983	19,983									
	Total -	39,908	39,908									
Eldorado	Federal	117,725	47,901	69,824	36,333	10,100,528	42,105	25,114	1,897,876	111,929	61,447	11,998,404
	Private	126,507	34,829	91,678	58,304	14,011,512	52,900	29,217	2,666,684	144,578	87,521	16,678,196
	State	2,642	40	2,602	1,634	310,891	1,103	383	18,706	3,705	2,017	329,597
	Total -	246,874	82,770	164,104	96,271	24,422,931	96,106	54,714	4,583,266	260,212	150,985	29,006,197
Stanislaus	Federal	106,691	28,011	78,680	34,253	8,484,525	80,341	37,686	7,088,310	159,021	71,939	15,572,835
	Private	122,526	16,495	106,031	52,621	17,561,911	66,481	35,008	3,959,853	172,512	87,629	21,521,764
	State	407		407	129	16,768				407	129	16,768
	Total -	229,624	44,506	185,118	87,003	26,063,204	146,822	72,694	11,048,163	331,940	159,697	37,111,367
Sierra	Federal	173,391	126,686	46,705	88,169	18,133,056	40,663	32,863	10,268,250	87,368	121,032	28,401,306
	Private	49,082	32,926	16,156	24,382	5,708,223	9,602	6,392	1,143,174	25,758	30,774	6,851,397
	State	40	40									
	Total -	222,513	159,652	62,861	112,551	23,841,279	50,265	39,255	11,411,424	113,126	151,806	35,252,703
Sequoia	Federal	43,930	43,930									
	Private	18,880	18,880									
	Total -	62,810	62,810									
TOTAL ALL NATIONAL FORESTS	Federal	884,272	580,371	303,901	241,660	51,906,945	218,507	130,306	22,651,490	522,408	371,966	74,558,435
	Private	862,992	505,132	357,860	250,210	56,146,665	204,247	111,724	12,335,189	562,107	361,934	68,481,854
	State	6,640	3,591	3,049	1,784	332,279	1,103	383	18,706	4,152	2,167	350,985
	Total -	1,753,904	1,089,094	664,810	493,654	108,385,889	423,857	242,413	35,005,385	1,088,667	736,067	143,391,274
National Parks												
Lassen Volcanic	Federal	17,425		17,425	5,679	756,696	3,040	1,561	123,705	20,465	7,240	880,401
	Private	140		140	55	14,977	15	6	738	155	61	15,715
	Total -	17,565		17,565	5,734	771,673	3,055	1,567	124,443	20,620	7,301	896,116
Yosemite	Federal	143,790	83,344	60,446	91,343	13,242,225	23,180	27,647	3,586,814	83,626	118,990	16,829,039
	Private	2,510	2,510									
	Total -	146,300	85,854	60,446	91,343	13,242,225	23,180	27,647	3,586,814	83,626	118,990	16,829,039
Kings Canyon	Federal	22,430	17,163	5,267	7,665	1,179,592	3,255	2,171	227,876	8,522	9,836	1,407,468
Sequoia	Federal	99,900	87,485	12,415	13,519	1,659,730	2,187	706	35,998	14,602	14,225	1,695,728
TOTAL ALL NATIONAL PARKS	Federal	283,545	187,992	95,553	118,206	16,838,243	31,662	32,085	3,974,393	127,215	150,291	20,812,636
	Private	2,650	2,510	140	55	14,977	15	6	738	155	61	15,715
	Total -	286,195	190,502	95,693	118,261	16,853,220	31,677	32,091	3,975,131	127,370	150,352	20,828,351
State Forests and Parks												
Latour Forest	Private	1,200	836	364	69	7,012				364	69	7,012
	State	1,160	1,086	74	14	1,426				74	14	1,426
	Total -	2,360	1,922	438	83	8,438				438	83	8,438
Calaveras Big Trees Park	Private	120		120	21	3,260	75	20	722	195	41	3,982
	State	1,973	225	1,748	1,318	185,001	1,265	472	26,595	3,013	1,790	211,596
	Total -	2,093	225	1,868	1,339	188,261	1,340	492	27,317	3,208	1,831	215,578
TOTAL ALL STATE FORESTS AND PARKS	Private	1,320	836	484	90	10,272	75	20	722	559	110	10,994
	State	3,133	1,311	1,822	1,332	186,427	1,265	472	26,595	3,087	1,804	213,022
	Total -	4,453	2,147	2,306	1,422	196,699	1,340	492	27,317	3,646	1,914	224,016
Totals for California												
TOTAL ALL CONTROL OPERATIONS CALIFORNIA	Federal: National Forest	884,272	580,371	303,901	241,660	51,906,945	218,507	130,306	22,651,490	522,408	371,966	74,558,435
	Federal: National Park	283,545	187,992	95,553	118,206	16,838,243	31,662	32,085	3,974,393	127,215	150,291	20,812,636
	Federal: Total -	1,167,817	768,363	399,454	359,866	68,745,188	250,169	162,391	26,625,883	649,623	522,257	95,371,071
	Private	866,962	508,478	358,484	250,355	56,171,914	204,337	111,750	12,336,649	562,821	362,105	68,508,563
	State	9,773	4,902	4,871	3,116	518,706	2,368	855	45,301	7,239	3,971	564,007
	Total -	2,044,552	1,281,743	762,809	613,337	125,435,808	456,874	274,996	39,007,833	1,219,683	888,333	164,443,641

TABLE 1 (Continued)

THE STATUS OF RIBES ERADICATION IN THE PACIFIC COAST REGION AS OF DECEMBER 31, 1946

PART B - OREGON

Control Operation	Class of Ownership	Control Units: Total Acres	Control Units: Acres Unworked	First Working: Acres Worked	First Working: Man Days	First Working: Ribes Eradicated	Reeradication: Acres Worked	Reeradication: Man Days	Reeradication: Ribes Eradicated	Total All Workings: Acres Worked	Total All Workings: Man Days	Total All Workings: Ribes Eradicated
National Forests												
Klamath	Federal – National Forest	9,031	4,416	4,615	6,318	536,553	1,056	544	11,083	5,671	6,862	547,636
	Federal – O & C	4,573	3,643	930	1,574	173,428	139	250	14,300	1,069	1,824	187,728
	Federal – Total -	13,604	8,059	5,545	7,892	709,981	1,195	794	25,383	6,740	8,686	735,364
	Private	1,552	723	829	1,882	113,810				829	1,882	113,810
	Total -	15,156	8,782	6,374	9,774	823,791	1,195	794	25,383	7,569	10,568	849,174
Rogue River	Federal – National Forest	87,491	21,586	65,905	39,607	14,624,266	36,111	15,846	1,374,846	102,016	55,453	15,999,112
	Federal – O & C	17,350	9,612	7,738	3,511	381,721				7,738	3,511	381,721
	Federal – Total -	104,841	31,198	73,643	43,118	15,005,987	36,111	15,846	1,374,846	109,754	58,964	16,380,833
	Private	79,010	5,885	73,125	8,846	1,225,069	13,496	2,549	210,949	86,621	11,395	1,436,018
	Total -	183,851	37,083	146,768	51,964	16,231,056	49,607	18,395	1,585,795	196,375	70,359	17,816,851
Siskiyou	Federal – National Forest	51,084	28,476	22,608	9,127	473,760	1,434	1,941	40,113	24,042	11,068	513,873
	Federal – O & C	75,896	42,776	33,120	9,195	497,271	3,628	3,063	53,427	36,748	12,258	550,698
	Federal – Total -	126,980	71,252	55,728	18,322	971,031	5,062	5,004	93,540	60,790	23,326	1,064,571
	Private	47,705	13,054	34,651	5,979	511,905	684	282	3,543	35,335	6,261	515,448
	State	300		300	43	8,328				300	43	8,328
	Total -	174,985	84,306	90,679	24,344	1,491,264	5,746	5,286	97,083	96,425	29,630	1,588,347
Umpqua	Federal – National Forest	60,353	60,353									
	Federal – O & C	6,158	6,158									
	Federal – Total -	66,511	66,511									
	Private	8,266	8,266									
	State	320	320									
	Total -	75,097	75,097									
TOTAL ALL NATIONAL FORESTS	Federal – National Forest	207,959	114,831	93,128	55,052	15,634,579	38,601	18,331	1,426,042	131,729	73,383	17,060,621
	Federal – O & C	103,977	62,189	41,788	14,280	1,052,420	3,767	3,313	67,727	45,555	17,593	1,120,147
	Federal – Total -	311,936	177,020	134,916	69,332	16,686,999	42,368	21,644	1,493,769	177,284	90,976	18,180,768
	Private	136,533	27,928	108,605	16,707	1,850,784	14,180	2,831	214,492	122,785	19,538	2,065,276
	State	620	320	300	43	8,328				300	43	8,328
	Total -	449,089	205,268	243,821	86,082	18,546,111	56,548	24,475	1,708,261	300,369	110,557	20,254,372
National Parks												
Crater Lake	Federal	3,782	150	3,632	412	130,162	350	81	13,430	3,982	493	143,592
Nursery Sanitation												
McDonald State Forest (Clark-McNary Nursery)	Private	418		418	178	2,547				418	178	2,547
	State	462	50	412	174	2,472				412	174	2,472
	Total -	880	50	830	352	5,019				830	352	5,019
O & C (McKinley Nursery)	O & C	168	58	110	162	5,462				110	162	5,462
	Private	132	92	40	111	2,877				40	111	2,877
	Total -	300	150	150	273	8,339				150	273	8,339
TOTAL ALL NURSERIES	O & C	168	58	110	162	5,462				110	162	5,462
	Private	550	92	458	289	5,424				458	289	5,424
	State	462	50	412	174	2,472				412	174	2,472
	Total -	1,180	200	980	625	13,358				980	625	13,358
Mt. Hebo White Pine Plantation												
Siuslaw National Forest	National Forest	680		680	373	124,744	212	228	29,957	892	601	154,701
Totals for Oregon												
TOTAL ALL CONTROL OPERATIONS OREGON	Federal – National Forest	208,639	114,831	93,808	55,425	15,759,323	38,813	18,559	1,455,999	132,621	73,984	17,215,322
	Federal – National Parks	3,782	150	3,632	412	130,162	350	81	13,430	3,982	493	143,592
	Federal – O & C	104,145	62,247	41,898	14,442	1,057,882	3,767	3,313	67,727	45,665	17,755	1,125,609
	Federal – Total -	316,566	177,228	139,338	70,279	16,947,367	42,930	21,953	1,537,156	182,268	92,232	18,484,523
	Private	137,083	28,020	109,063	16,996	1,856,208	14,180	2,831	214,492	123,243	19,827	2,070,700
	State	1,082	370	712	217	10,800				712	217	10,800
	Total -	454,731	205,618	249,113	87,492	18,814,375	57,110	24,784	1,751,648	306,223	112,276	20,566,023

PART C - TOTALS FOR THE PACIFIC COAST REGION

Control Operation	Class of Ownership	Control Units: Total Acres	Control Units: Acres Unworked	First Working: Acres Worked	First Working: Man Days	First Working: Ribes Eradicated	Reeradication: Acres Worked	Reeradication: Man Days	Reeradication: Ribes Eradicated	Total All Workings: Acres Worked	Total All Workings: Man Days	Total All Workings: Ribes Eradicated
CALIFORNIA AND OREGON	Federal – National Forest	1,092,911	695,202	397,709	297,085	67,666,268	257,320	148,865	24,107,489	655,029	445,950	91,773,757
	Federal – National Parks	287,327	188,142	99,185	118,618	16,968,405	32,012	32,166	3,987,823	131,197	150,784	20,956,228
	Federal – O & C	104,145	62,247	41,898	14,442	1,057,882	3,767	3,313	67,727	45,665	17,755	1,125,609
	Federal – Total -	1,484,383	945,591	538,792	430,145	85,692,555	293,099	184,344	28,163,039	831,891	614,489	113,855,594
	Private	1,004,045	536,498	467,547	267,351	58,028,122	218,517	114,581	12,551,141	686,064	381,932	70,579,263
	State	10,855	5,272	5,583	3,333	529,506	2,368	855	45,301	7,951	4,188	574,807
	Total -	2,499,283	1,487,361	1,011,922	700,829	144,250,1[illegible]	513,[illegible]84	[illegible]9,780	40,759,481	1,525,906	1,000,609	185,009,664

SUMMARY OF RIBES ERADICATION IN THE PACIFIC COAST REGION - 1946

Operation	Class of Work	Acres Worked	8-Hour Man Days	Ribes Eradicated
California				
Klamath National Forest	Initial	5,215	4,263	403,434
	Reeradication	7,126	7,314	231,291
	Totals	12,341	11,577	634,725
Lassen National Forest	Initial	9,577	7,030	1,047,193
	Reeradication	8,369	3,332	426,546
	Totals	17,946	10,362	1,473,739
Plumas National Forest	Initial	5,678	7,452	1,758,137
	Reeradication	6,232	4,420	383,245
	Totals	11,910	11,872	2,141,382
Eldorado National Forest	Initial	6,726	6,960	1,140,701
	Reeradication	3,310	2,029	284,836
	Totals	10,036	8,989	1,425,537
Stanislaus National Forest	Initial	2,201	1,767	512,636
	Reeradication	7,989	5,418	927,475
	Totals	10,190	7,185	1,440,111
Sierra National Forest	Reeradication	5,724	5,472	933,798
NATIONAL FOREST TOTALS	Initial	29,397	27,472	4,862,101
	Reeradication	38,750	27,985	3,187,191
	Totals	68,147	55,457	8,049,292
Latour State Forest	Initial	438	83	8,438
Yosemite National Park	Initial	2,483	3,129	386,787
	Reeradication	3,899	4,001	364,633
	Totals	6,382	7,130	751,420
Kings Canyon National Park	Initial	833	1,168	184,890
	Reeradication	654	193	14,643
	Totals	1,487	1,361	199,533
Sequoia National Park	Initial	610	1,124	81,474
	Reeradication	1,224	452	27,796
	Totals	1,834	1,576	109,270
NATIONAL PARK TOTALS	Initial	3,926	5,421	653,151
	Reeradication	5,777	4,646	407,072
	Totals	9,703	10,067	1,060,223
CALIFORNIA TOTALS	Initial	33,761	32,976	5,523,690
	Reeradication	44,527	32,631	3,594,263
	Totals	78,288	65,607	9,117,953
Oregon				
Rogue River National Forest	Initial	1,600	1,994	122,209
	Reeradication	2,990	1,924	47,536
	Totals	4,590	3,918	169,745
Siskiyou National Forest	Initial	560	383	8,428
	Reeradication	3,908	3,603	57,456
	Totals	4,468	3,986	65,884
Klamath National Forest	Initial	759	1,266	86,563
	Reeradication	1,195	794	25,383
	Totals	1,954	2,060	111,946
OREGON TOTALS	Initial	2,919	3,643	217,200
	Reeradication	8,093	6,321	130,375
	Totals	11,012	9,964	347,575
Pacific Coast Region				
CALIFORNIA AND OREGON	Initial	36,680	36,619	5,740,890
	Reeradication	52,620	38,952	3,724,638
	Totals	89,300	75,571	9,465,528

TABLE 3

SUMMARY OF RIBES ERADICATION BY AGENCY AND BY LAND OWNERSHIP IN THE PACIFIC COAST REGION - 1946

Work Agency	Acres			8-Hour Man Days	Total Ribes Eradicated	Per Acre Worked		Ownership Status																		Acres Ribes-Free At Re-eradication
								Acres Covered						8-Hour Man Days						Ribes Eradicated						
								Federal						Federal						Federal						
	Worked	Blocked Out	Total			8-Hour Man Days	Ribes	National Forest	National Park	O & C	Total	Private	State	National Forest	National Park	O & C	Total	Private	State	National Forest	National Park	O & C	Total	Private	State	
Initial Work																										
California: B.E.P.Q.	16,831	2,020	18,851	16,534	3,155,997	0.98	188	3,868			3,868	14,909	74	3,316			3,316	13,204	14	835,584			835,584	2,318,987	1,426	
Forest Service	9,850	1,134	10,984	11,021	1,714,542	1.12	174	6,490			6,490	4,494		7,405			7,405	3,616		1,133,017			1,133,017	581,525		
Park Service	3,926		3,926	5,421	653,151	1.38	166		3,926		3,926				5,421		5,421				653,151		653,151			
Subtotals -	30,607	3,154	33,761	32,976	5,523,690	1.08	180	10,358	3,926		14,284	19,403	74	10,721	5,421		16,142	16,820	14	1,968,601	653,151		2,621,752	2,900,512	1,426	
Oregon: Forest Service	1,137	182	1,319	1,649	94,991	1.45	84	720		279	999	320		926		542	1,468	181		58,687		31,716	90,403	4,588		
O & C Admin.	1,600		1,600	1,994	122,209	1.25	76			960	960	640				1,304	1,304	690				106,738	106,738	15,471		
Subtotals -	2,737	182	2,919	3,643	217,200	1.33	79	720		1,239	1,959	960		926		1,846	2,772	871		58,687		138,454	197,141	20,059		
Totals -	33,344	3,336	36,680	36,619	5,740,890	1.10	172	11,078	3,926	1,239	16,243	20,363	74	11,647	5,421	1,846	18,914	17,691	14	2,027,288	653,151	138,454	2,818,893	2,920,571	1,426	
Reeradication Work																										
California: B.E.P.Q.	19,883		19,883	11,225	1,650,587	0.56	83	2,718			2,718	17,165		2,326			2,326	8,899		372,470			372,470	1,278,117		3,506
Forest Service	18,867		18,867	16,760	1,536,604	0.89	81	11,008			11,008	7,859		10,358			10,358	6,402		1,289,615			1,289,615	246,989		9,156
Park Service	5,777		5,777	4,646	407,072	0.80	70		5,777		5,777				4,646		4,646				407,072		407,072			3,870
Subtotals -	44,527		44,527	32,631	3,594,263	0.73	81	13,726	5,777		19,503	25,024		12,684	4,646		17,330	15,301		1,662,085	407,072		2,069,157	1,525,106		16,532
Oregon: Forest Service	5,415		5,415	3,634	87,215	0.67	16	4,142		979	5,121	294		2,627		813	3,440	194		55,799		25,629	81,428	5,787		3,866
O & C Admin.	2,678		2,678	2,687	43,160	1.00	16	634		1,670	2,304	374		728		1,802	2,530	157		10,288		30,107	40,395	2,765		3,922
Subtotals -	8,093		8,093	6,321	130,375	0.78	16	4,776		2,649	7,425	668		3,355		2,615	5,970	351		66,087		55,736	121,823	8,552		7,788
Totals -	52,620		52,620	38,952	3,724,638	0.74	71	18,502	5,777	2,649	26,928	25,692		16,039	4,646	2,615	23,300	15,652		1,728,172	407,072	55,736	2,190,980	1,533,658		24,320
All Workings																										
California: B.E.P.Q.	36,714	2,020	38,734	27,759	4,806,584	0.76	131	6,586			6,586	32,074	74	5,642			5,642	22,103	14	1,208,054			1,208,054	3,597,104	1,426	3,506
Forest Service	28,717	1,134	29,851	27,781	3,251,146	0.97	113	17,498			17,498	12,353		17,763			17,763	10,018		2,422,632			2,422,632	828,514		9,156
Park Service	9,703		9,703	10,067	1,050,223	1.04	109		9,703		9,703				10,067		10,067				1,060,223		1,060,223			3,870
Subtotals -	75,134	3,154	78,288	65,607	9,117,953	0.87	121	24,084	9,703		33,787	44,427	74	23,405	10,067		33,472	32,121	14	3,630,686	1,060,223		4,690,909	4,425,618	1,426	16,532
Oregon: Forest Service	6,552	182	6,734	5,283	182,206	0.81	28	4,862		1,258	6,120	614		3,553		1,355	4,908	375		114,486		57,345	171,831	10,375		3,866
O & C Admin.	4,278		4,278	4,681	165,369	1.09	39	634		2,630	3,264	1,014		728		3,106	3,834	847		10,288		136,845	147,133	18,236		3,922
Subtotals -	10,830	182	11,012	9,964	347,575	1.02	32	5,496		3,888	9,384	1,628		4,281		4,461	8,742	1,222		124,774		194,190	318,964	28,611		7,788
Totals -	85,964	3,336	89,300	75,571	9,465,528	0.88	110	29,580	9,703	3,888	43,171	46,055	74	27,686	10,067	4,461	42,214	33,343	14	3,755,460	1,060,223	194,190	5,009,873	4,454,229	1,426	24,320

TABLE 4

SUMMARY OF RIBES ERADICATION BY LAND OWNERSHIP AND NUMBER OF WORKING IN THE PACIFIC COAST REGION IN 1946

	Status Of Ribes Eradication												Total All Workings		
	First Working			Second Working			Third Working			Fourth Working					
Land Ownership	Acres Worked	8-Hour Man Days	Ribes Eradicated	Acres Worked	8-Hour Man Days	Ribes Eradicated	Acres Worked	8-Hour Man Days	Ribes Eradicated	Acres Worked	8-Hour Man Days	Ribes Eradicated	Acres Worked	8-Hour Man Days	Ribes Eradicated
						California									
National Forest	10,358	10,721	1,968,601	6,782	6,524	820,523	5,488	4,585	541,966	1,456	1,575	299,596	24,084	23,405	3,630,686
National Park	3,926	5,421	653,151	3,008	2,911	316,997	2,769	1,735	90,075				9,703	10,067	1,060,223
Subtotals - Federal	14,284	16,142	2,621,752	9,790	9,435	1,137,520	8,257	6,320	632,041	1,456	1,575	299,596	33,787	33,472	4,690,909
Private	19,403	16,820	2,900,512	12,001	8,322	779,455	10,127	5,188	604,830	2,896	1,791	140,821	44,427	32,121	4,425,618
State	74	14	1,426										74	14	1,426
Totals - - - - -	33,761	32,976	5,523,690	21,791	17,757	1,916,975	18,384	11,508	1,236,871	4,352	3,366	440,417	78,288	65,607	9,117,953
						Oregon									
National Forest	720	926	58,687	3,168	2,244	38,195	991	588	16,136	617	523	11,756	5,496	4,281	124,774
O & C Rev. Lands Admin.	1,239	1,846	138,454	1,961	1,820	45,390	688	795	10,346				3,888	4,461	194,190
Subtotals - Federal	1,959	2,772	197,141	5,129	4,064	83,585	1,679	1,383	26,482	617	523	11,756	9,384	8,742	318,964
Private	960	871	20,059	516	274	5,893	57	22	34	95	55	2,625	1,628	1,222	28,611
Totals - - - - -	2,919	3,643	217,200	5,645	4,338	89,478	1,736	1,405	26,516	712	578	14,381	11,012	9,964	347,575
						Pacific Coast Region									
National Forest	11,078	11,647	2,027,288	9,950	8,768	858,718	6,479	5,173	558,102	2,073	2,098	311,352	29,580	27,686	3,755,460
National Park	3,926	5,421	653,151	3,008	2,911	316,997	2,769	1,735	90,075				9,703	10,067	1,060,223
O & C Rev. Lands Admin.	1,239	1,846	138,454	1,961	1,820	45,390	688	795	10,346				3,888	4,461	194,190
Subtotals - Federal	16,243	18,914	2,818,893	14,919	13,499	1,221,105	9,936	7,703	658,523	2,073	2,098	311,352	43,171	42,214	5,009,873
Private	20,363	17,691	2,920,571	12,517	8,596	785,348	10,184	5,210	604,864	2,991	1,846	143,446	46,055	33,343	4,454,229
State	74	14	1,426										74	14	1,426
Grand Totals - - -	36,680	36,619	5,740,890	27,436	22,095	2,006,453	20,120	12,913	1,263,387	5,064	3,944	454,798	89,300	75,571	9,465,528

TABLE 5

SUMMARY OF RIBES ERADICATION BY LAND OWNERSHIP AND NUMBER OF WORKING IN THE PACIFIC COAST REGION 1925-1946

	Status Of Ribes Eradication															Total All Workings		
	First Working			Second Working			Third Working			Fourth Working			Fifth Working					
Land Ownership	Acres Worked	8-Hour Man Days	Ribes Eradicated	Acres Worked	8-Hour Man Days	Ribes Eradicated	Acres Worked	8-Hour Man Days	Ribes Eradicated	Acres Worked	8-Hour Man Days	Ribes Eradicated	Acres Worked	8-Hour Man Days	Ribes Eradicated	Acres Worked	8-Hour Man Days	Ribes Eradicated
									California									
National Forest	303,901	241,660	51,906,945	158,643	92,103	15,956,785	48,428	32,190	6,014,189	8,028	4,827	528,542	3,408	1,186	151,974	522,408	371,966	74,558,435
National Park	95,553	118,206	16,838,243	27,584	28,230	3,724,587	4,078	3,855	249,806							127,215	150,291	20,812,636
Subtotals - Federal	399,454	359,866	68,745,188	186,227	120,333	19,681,372	52,506	36,045	6,263,995	8,028	4,827	528,542	3,408	1,186	151,974	649,623	522,257	95,371,071
Private	358,484	250,355	56,171,914	157,690	89,552	9,329,524	40,464	18,506	2,736,495	5,893	3,637	268,023	290	55	2,607	562,821	362,105	68,508,563
State	4,871	3,116	518,706	2,213	814	44,114	155	41	1,187							7,239	3,971	564,007
Totals - - - - -	762,809	613,337	125,435,808	346,130	210,699	29,055,010	93,125	54,592	9,001,677	13,921	8,464	796,565	3,698	1,241	154,581	1,219,683	888,333	164,443,641
									Oregon									
National Forest	93,808	55,425	15,759,323	31,899	13,724	1,230,866	5,721	4,017	210,736	1,193	818	14,397				132,621	73,984	17,215,322
National Park	3,632	412	130,162	350	81	13,430										3,982	493	143,592
O & C Rev. Lands Admin.	41,898	14,442	1,057,882	3,079	2,518	57,381	688	795	10,346							45,665	17,755	1,125,609
Subtotals - Federal	139,338	70,279	16,947,367	35,328	16,323	1,301,677	6,409	4,812	221,082	1,193	818	14,397				182,268	92,232	18,484,523
Private	109,063	16,996	1,856,208	13,373	2,428	193,021	699	340	18,780	108	63	2,691				123,243	19,827	2,070,700
State	712	217	10,800													712	217	10,800
Totals - - - - -	249,113	87,492	18,814,375	48,701	18,751	1,494,698	7,108	5,152	239,862	1,301	881	17,088				306,223	112,276	20,566,023
									Pacific Coast Region									
National Forest	397,709	297,085	67,666,268	190,542	105,827	17,187,651	54,149	36,207	6,224,925	9,221	5,645	542,939	3,408	1,186	151,974	655,029	445,950	91,773,757
National Park	99,185	118,618	16,968,405	27,934	28,311	3,738,017	4,078	3,855	249,806							131,197	150,784	20,956,228
O & C Rev. Lands Admin.	41,898	14,442	1,057,882	3,079	2,518	57,381	688	795	10,346							45,665	17,755	1,125,609
Subtotals - Federal	538,792	430,145	85,692,555	221,555	136,656	20,983,049	58,915	40,857	6,485,077	9,221	5,645	542,939	3,408	1,186	151,974	831,891	614,489	113,855,594
Private	467,547	267,351	58,028,122	171,063	91,980	9,522,545	41,163	18,846	2,755,275	6,001	3,700	270,714	290	55	2,607	686,064	381,932	70,579,263
State	5,583	3,333	529,506	2,213	814	44,114	155	41	1,187							7,951	4,188	574,807
Grand Totals - - -	1,011,922	700,829	144,250,183	394,831	229,450	30,549,708	100,233	59,744	9,241,539	15,222	9,345	813,653	3,698	1,241	154,581	1,525,906	1,000,609	185,009,664

TABLE 6
(Omnibus Table 2 - Sheet 6)

ACREAGE WORKED ON INTERMINGLED LANDS - 1946

Intermingled Lands	First Working Acres	Second Working Acres	Other Workings Acres	All Workings Acres
California	3,310	2,039	2,214	7,563
Oregon	432	232	69	733
Totals	3,742	2,271	2,283	8,296
Estimated Ribes Pulled	535,106	143,073	130,131	808,310
Estimated Man Days Used	3,256	1,567	1,233	6,056

TABLE 7
(Omnibus Table B - Sheet 6)

STATUS OF RIBES ERADICATION ON INTERMINGLED LANDS, DECEMBER 31, 1946

Intermingled Lands	Total Acres Intermingled Lands Control Area (White Pine and Protective Zone)	First Working		Second Working Acres	Other Workings Acres	On Maintenance		Remaining Work	
		Acres	Per Cent			Acres	Per Cent	Unworked Acres	Requiring Rework Acres
California	149,665	55,353	37	27,184	7,956	25,827	17	94,312	29,526
Oregon	62,605	44,000	70	6,018	363	16,143	26	18,605	27,857
Totals	212,270	99,353	47	33,202	8,319	41,970	20	112,917	57,383

TABLE 8

THE DISTRIBUTION OF CAMPS IN THE PACIFIC COAST REGION DURING 1946

Control Operation	Agency and Fund	County	Number and Average Size of Camps	Approximate Period of Operation	Location
			Oregon		
Siskiyou	FS - Reg.	Josephine	1 - 50 1 - 15	June 1 - Sept. 6	Oregon Caves - Limestone Creek
	O&C - Reg.	Josephine	2 - 50	June 1 - Sept. 10	Swede Basin - Spaulding Mill
Rogue River	FS - Reg.	Jackson	1 - 50	May 15 - Sept. 30	Union Creek
	FS - Reg.	Douglas	1 - 30	July 1 - Sept. 6	Foster Creek
	O&C - Reg.	Jackson	1 - 100	July 1 - Sept. 15	Pinehurst
Klamath	FS - Reg.	Jackson	1 - 100	July 3 - Aug. 30	Cottonwood
			California		
Klamath	FS - Reg.	Siskiyou	5 - 50	May 16 - Oct. 1	Hungry Creek - Cinnabar Springs Beaver Creek - Doggett Creek Finley Gulch
Lassen	State Div. of For. - CYA	Shasta	1 - 30	April 30 - Oct. 14	Whitmore
	EQ - Reg.	Shasta	1 - 90	May 13 - Oct. 4	Hatchet Mountain
	EQ - Reg.	Tehama	1 - 50 1 - 55	May 20 - Sept. 30	Mill Creek - Soda Springs
	EQ - Reg.	Butte	1 - 50	June 10 - Sept. 3	Rag Dump
	EQ - Reg.	Plumas	1 - 50	June 12 - Sept. 9	Humbug
Plumas	EQ - Reg.	Plumas	2 - 50 1 - 55	May 7 - Oct. 9	American House - Camel Peak Walter's Mine
	FS - Reg.	Plumas	2 - 50 1 - 25	June 12 - Sept. 26	Canyon Dam - Granite Basin Feather River
	FS - Reg.	Butte	2 - 50	June 10 - Oct. 14	Mooreville Ridge - Big Bar
Eldorado	State Div. of For. - CYA	Amador	1 - 15	May 6 - Oct. 11	Dew Drop
	EQ - Reg.	Eldorado	3 - 50 1 - 20	May 14 - Sept. 27	Davis Cabin - China Flat Cold Spring - Pi Pi
	FS - Reg.	Eldorado	1 - 50	June 18 - Aug. 28	Pi Pi
Stanislaus	EQ - Reg.	Tuolumne	2 - 50	May 6 - Sept. 30	Jawbone - Fisher Creek
	FS - Reg.	Tuolumne	2 - 50	June 12 - Sept. 10	Crane Meadow - Rush Creek
Sierra	EQ - Reg.	Mariposa	1 - 50	June 11 - Sept. 6	Miami
	FS - Reg.	Mariposa	1 - 50	June 18 - Aug. 25	Summit
	FS - Reg.	Madera	1 - 50	June 19 - Sept. 6	Soquel
Sequoia-Kings Canyon	NP - Reg.	Tulare	1 - 50	June 4 - Aug. 23	Red Fir
	NP - Reg.	Fresno	1 - 50	June 26 - Aug. 28	Cedar Springs
Yosemite	NP - Reg.	Mariposa	2 - 50	June 14 - Sept. 3	Crane Flat - Sugar Pine Pass
	NP - Reg.	Mariposa	2 - 50	May 3 - Nov. 1	Wawona
	NP - Reg.	Tuolumne	1 - 50	June 18 - Aug. 23	Carl Inn

TABLE 9

SUMMARY OF CHECKING IN THE PACIFIC COAST REGION - 1946

Operation	Regular Check			Advance Check			Post Check		
	Acres Covered By Final Check	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days
Oregon									
Rogue River	5,127	4.9	135.8	4,680	3.2	58.1	11,003	5.1	224.5
Siskiyou	7,260	5.5	192.6	-	-	-	8,630	5.2	170.4
Wind River	-	-	-	-	-	-	1,440	5.2	19.6
Totals	12,387	5.2	328.4	4,680	3.2	58.1	21,073	5.2	414.5
California									
Klamath	14,963	4.9	286.0	6,986	3.6	112.8	8,938	4.4	144.7
Lassen	15,951	4.8	266.8	20,215	3.0	252.9	22,733	3.4	263.8
Plumas	9,251	4.2	165.7	8,856	3.1	125.7	24,365	4.3	400.6
Eldorado	7,739	4.3	135.1	6,799	2.6	55.6	21,608	3.6	279.8
Stanislaus	8,370	4.5	144.7	3,400	2.6	31.5	9,350	3.5	85.3
Sierra - Parks	13,257	4.8	328.6	896	4.4	7.7	11,999	3.9	294.7
Totals	69,531	4.6	1,326.9	47,152	3.1	586.2	98,993	3.8	1,468.9
Pacific Coast Region									
Totals	81,918	4.7	1,655.3	51,832	3.1	644.3	120,066	4.1	1,883.4

TABLE 10

ANALYSIS OF CHECKING COST AND PRODUCTION IN THE PACIFIC COAST REGION - 1946

State	Class Of Check	Man Days	Per Cent Of Total Man Days	Strip Acres	Strip Acres Per Man Day	Strip Acres Per Field Man Day	Total Cost	Cost Per Acre Basis Acres Covered By Check	Cost Per Strip Acre
Oregon	Regular	328.4	38.5	650.1	2.0	2.6	$ 3,848.09	$0.311	$5.92
	Advance	58.1	6.8	149.9	2.6	3.4	680.80	0.145	4.54
	Post	414.5	48.5	1,087.0	2.6	3.4	4,856.99	0.230	4.47
	All	801.0	93.8	1,887.0	2.4	3.1	9,385.88	0.246	4.97
California	Regular	1,326.9	31.1	3,228.7	2.4	3.1	15,293.66	0.220	4.74
	Advance	586.2	13.7	1,439.5	2.5	3.0	6,676.09	0.142	4.64
	Post	1,468.9	34.4	3,805.1	2.6	3.3	17,064.26	0.172	4.48
	All	3,382.0	79.3	8,473.3	2.5	3.2	39,034.01	0.181	4.61
Totals Pacific Coast Region	Regular	1,655.3	32.3	3,878.8	2.3	3.0	19,141.75	0.234	4.93
	Advance	644.3	12.6	1,589.4	2.5	3.0	7,356.89	0.142	4.63
	Post	1,883.4	36.8	4,892.1	2.6	3.3	21,921.25	0.183	4.48
	All	4,183.0	81.7	10,360.3	2.5	3.2	$48,419.89	$0.191	$4.67

TABLE 11

ANALYSIS OF CHECKING TIME DEVOTED TO OTHER ACTIVITIES IN THE PACIFIC COAST REGION - 1946

State	Eradication		Pine Count		Section Line Control		Scouting		Total		Per Cent Of Total Man Days*	Fire*	
	Man Days	Total Cost	Man Days	Total Cost	Man Days	Total Cost	Man Days	Total Cost	Man Days	Total Cost		Man Days	Total Cost
Oregon	1.0	$ 11.72	-	-	52.0	$ 609.32	-	-	53.0	$ 621.04	6.2	16.5	$ 177.78
California	411.0	4,841.01	80.0	$912.05	343.5	3,973.08	49.0	$568.57	883.5	10,294.71	20.7	263.0	3,536.03
Totals	412.0	$4,852.73	80.0	$912.05	395.5	$4,582.40	49.0	$568.57	936.5	$10,915.75	18.3	279.5	$3,713.81

*Costs of fires were reimbursed. Therefore man days are not included in figuring percentages.

MAPS OF ACTIVE CONTROL OPERATIONS SHOWING

THE STATUS OF BLISTER RUST CONTROL

AS OF DECEMBER 31, 1946

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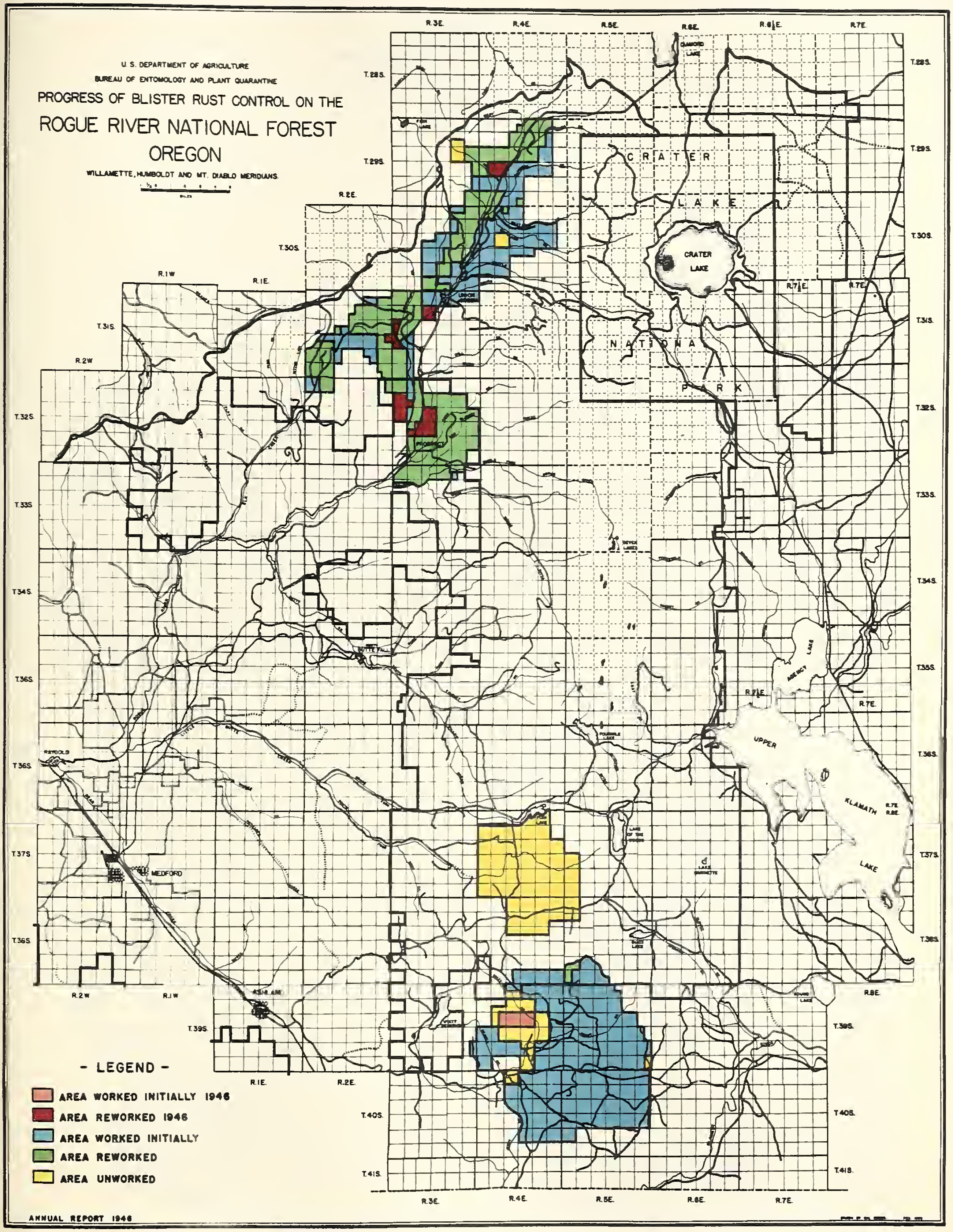
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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
PROGRESS OF BLISTER RUST CONTROL ON THE
ROGUE RIVER NATIONAL FOREST
OREGON
WILLAMETTE, HUMBOLDT AND MT. DIABLO MERIDIANS
CRATER LAKE NATIONAL PARK
CRATER LAKE
UPPER KLAMATH LAKE
AGENCY LAKE
MEDFORD
ASHLAND
PROSPECT
BUTTE FALLS
- LEGEND -
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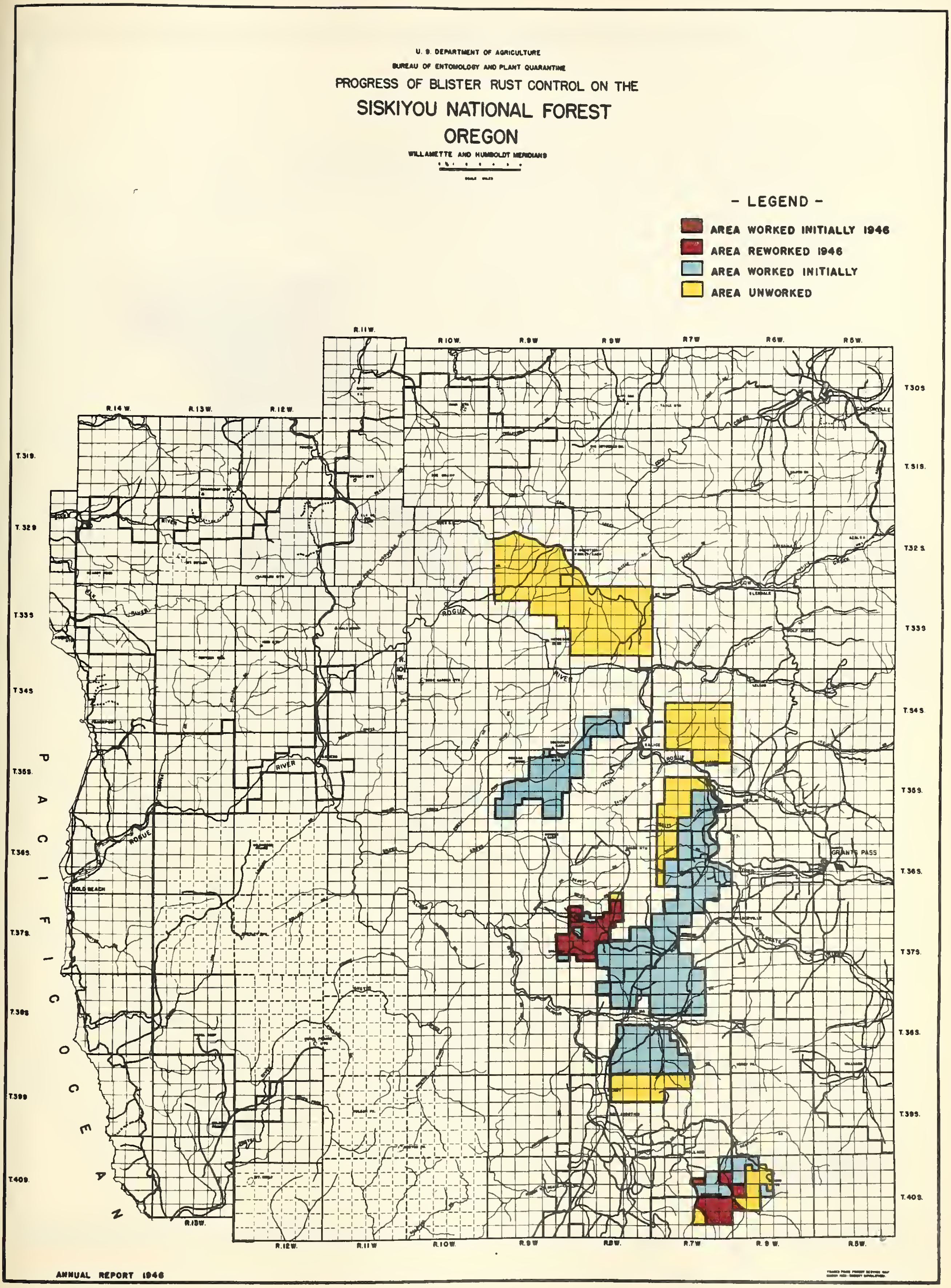
AREA REWORKED 1946
AREA WORKED INITIALLY
AREA REWORKED
AREA UNWORKED
ANNUAL REPORT 1946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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
PROGRESS OF BLISTER RUST CONTROL ON THE
SISKIYOU NATIONAL FOREST
OREGON
WILLAMETTE AND HUMBOLDT MERIDIANS
- LEGEND -
AREA WORKED INITIALLY 1946
AREA REWORKED 1946
AREA WORKED INITIALLY
AREA UNWORKED
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R.10W.
R.9W
R.8W
R.7W
R.6W.
R.5W.
R.14 W.
R.13 W.
R.12 W.
T.30S
T.31S.
T.32S.
T.33S
T.34S
T.35S.
T.36S.
T.37S.
T.38S.
T.39S.
T.40S.
PACIFIC OCEAN
ROGUE
RIVER
GRANTS PASS
GOLD BEACH
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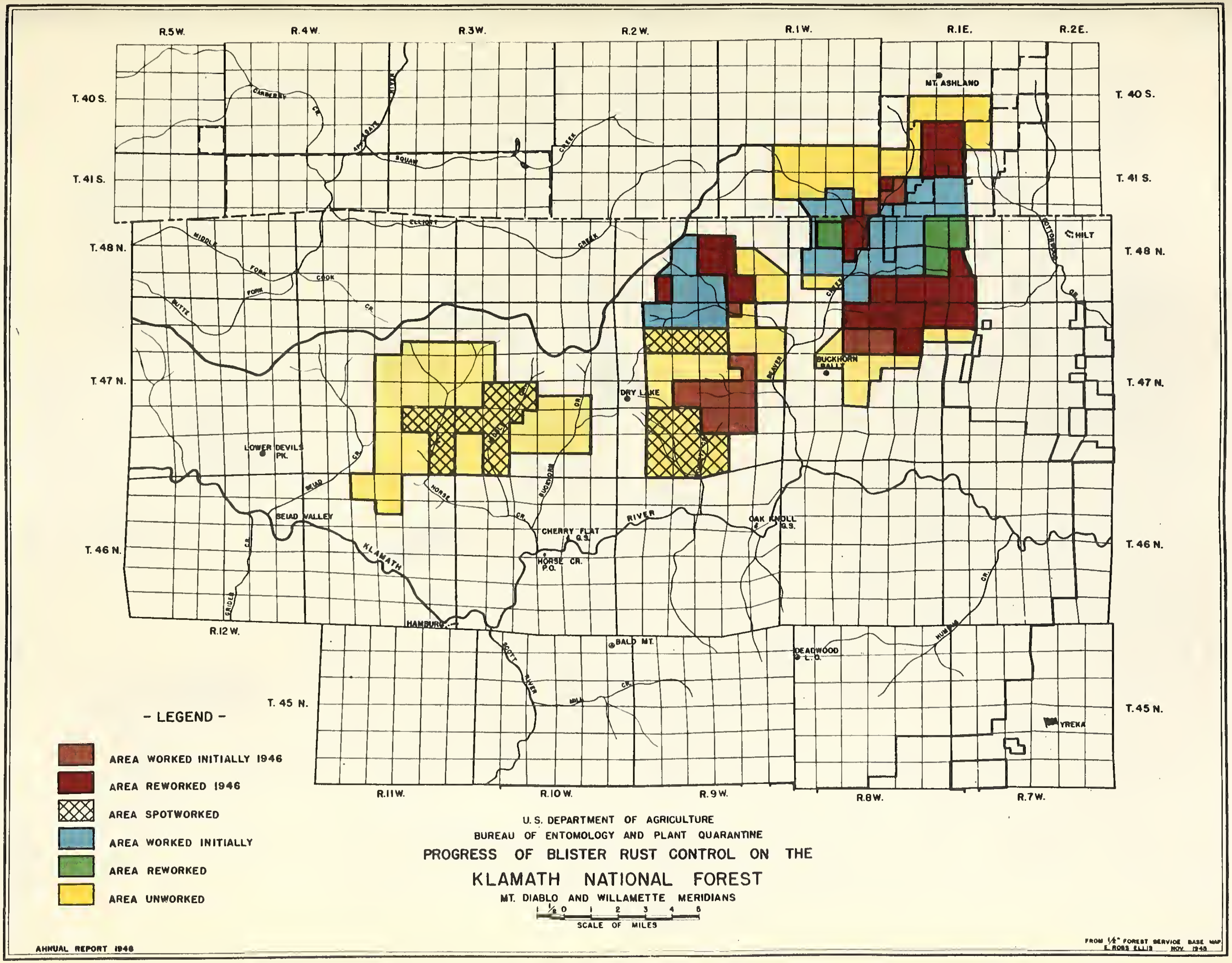
R.11W
R.10W.
R.9W
R.8W.
R.7W.
R.5W.
ANNUAL REPORT 1946



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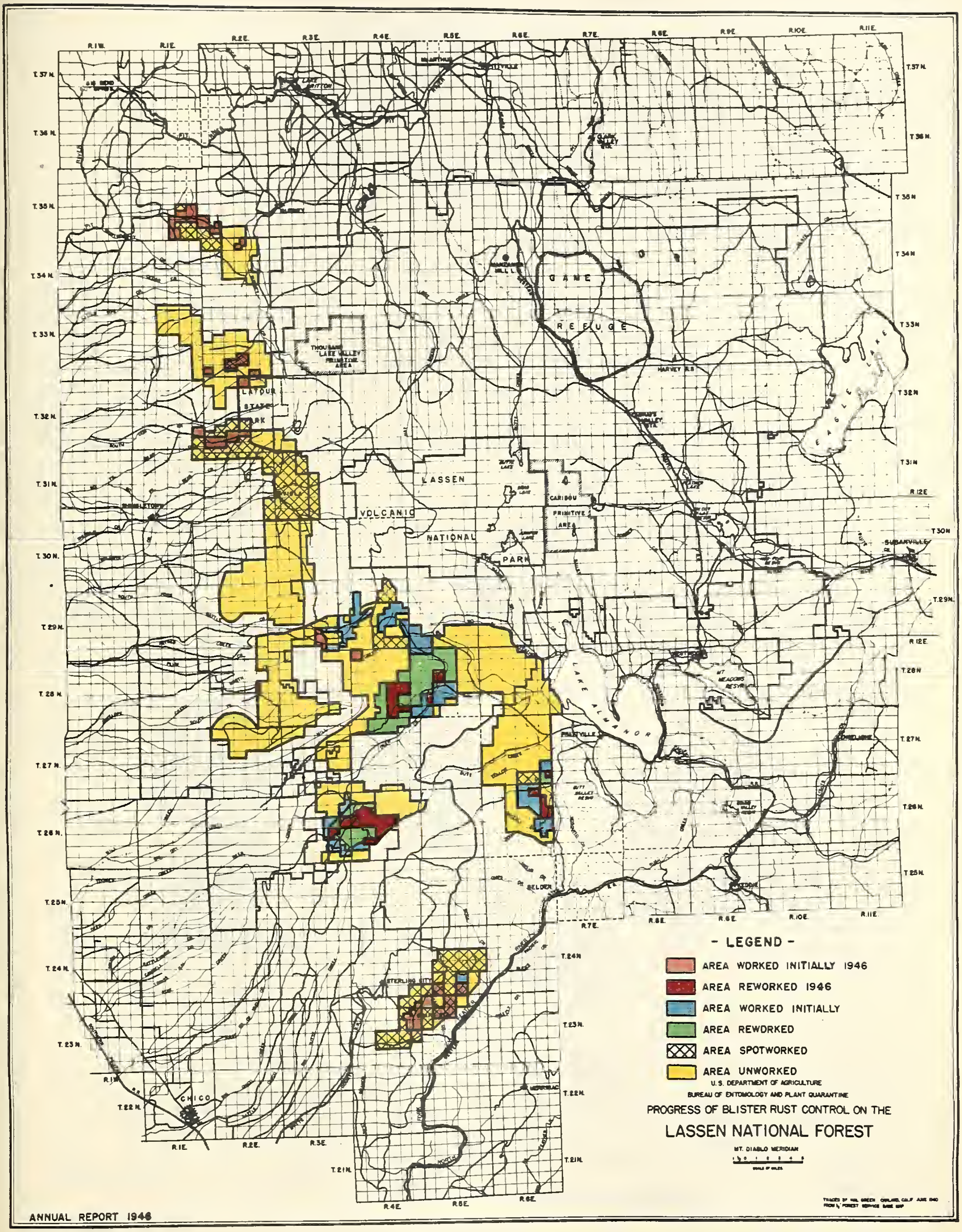
PROGRESS OF BLISTER RUST CONTROL ON THE
KLAMATH NATIONAL FOREST
MT. DIABLO AND WILLAMETTE MERIDIANS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AREA WORKED INITIALLY 1946
AREA REWORKED 1946
AREA WORKED INITIALLY
AREA REWORKED
AREA SPOTWORKED
AREA UNWORKED
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PROGRESS OF BLISTER RUST CONTROL ON THE
LASSEN NATIONAL FOREST
MT. DIABLO MERIDIAN
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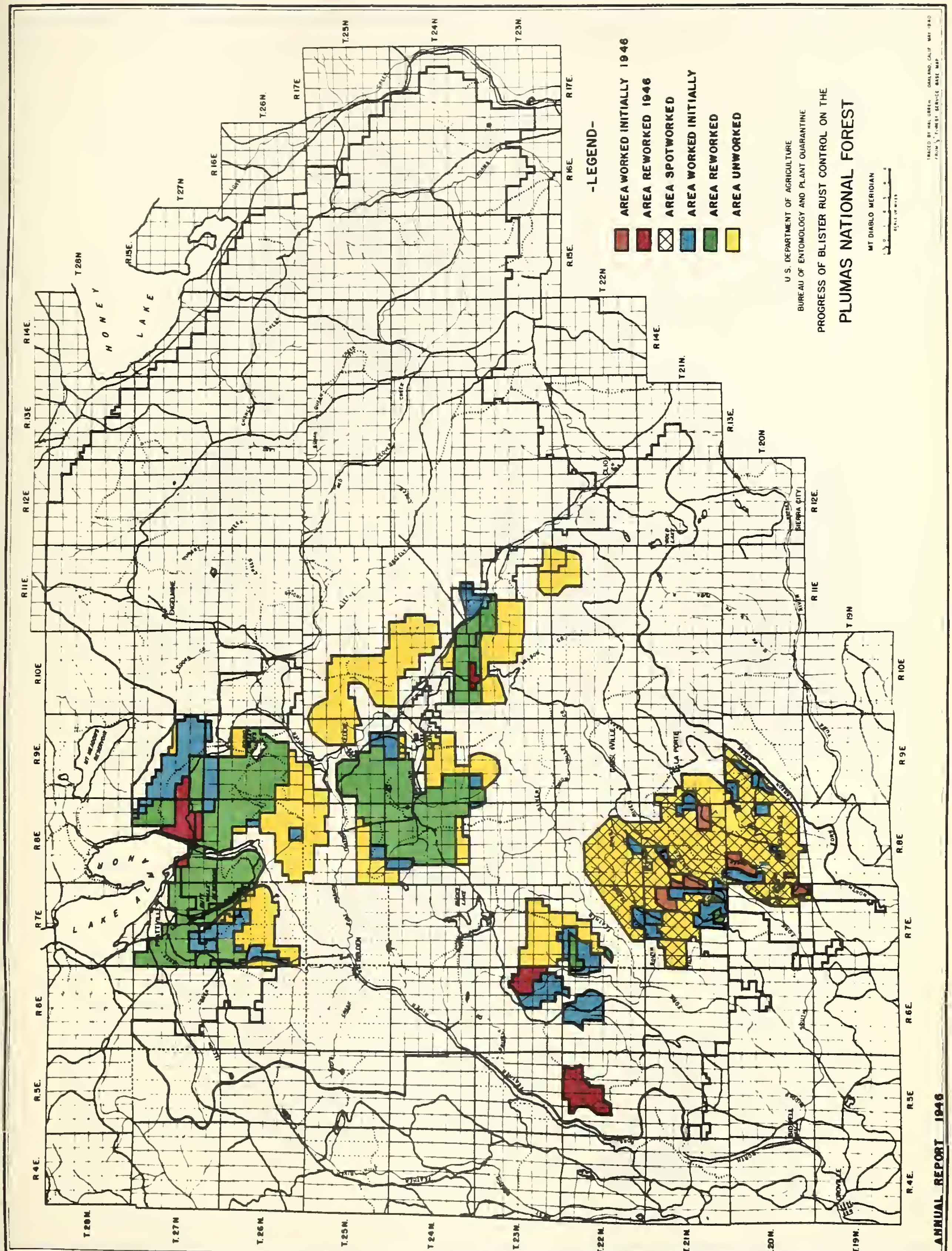
GAME REFUGE
EAGLE LAKE
LAKE ALMANOR
CHICO
SUSANVILLE
ANNUAL REPORT 1946



-LEGEND-
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AREA SPOTWORKED
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AREA REWORKED
AREA UNWORKED
U.S. DEPARTMENT OF AGRICULTURE
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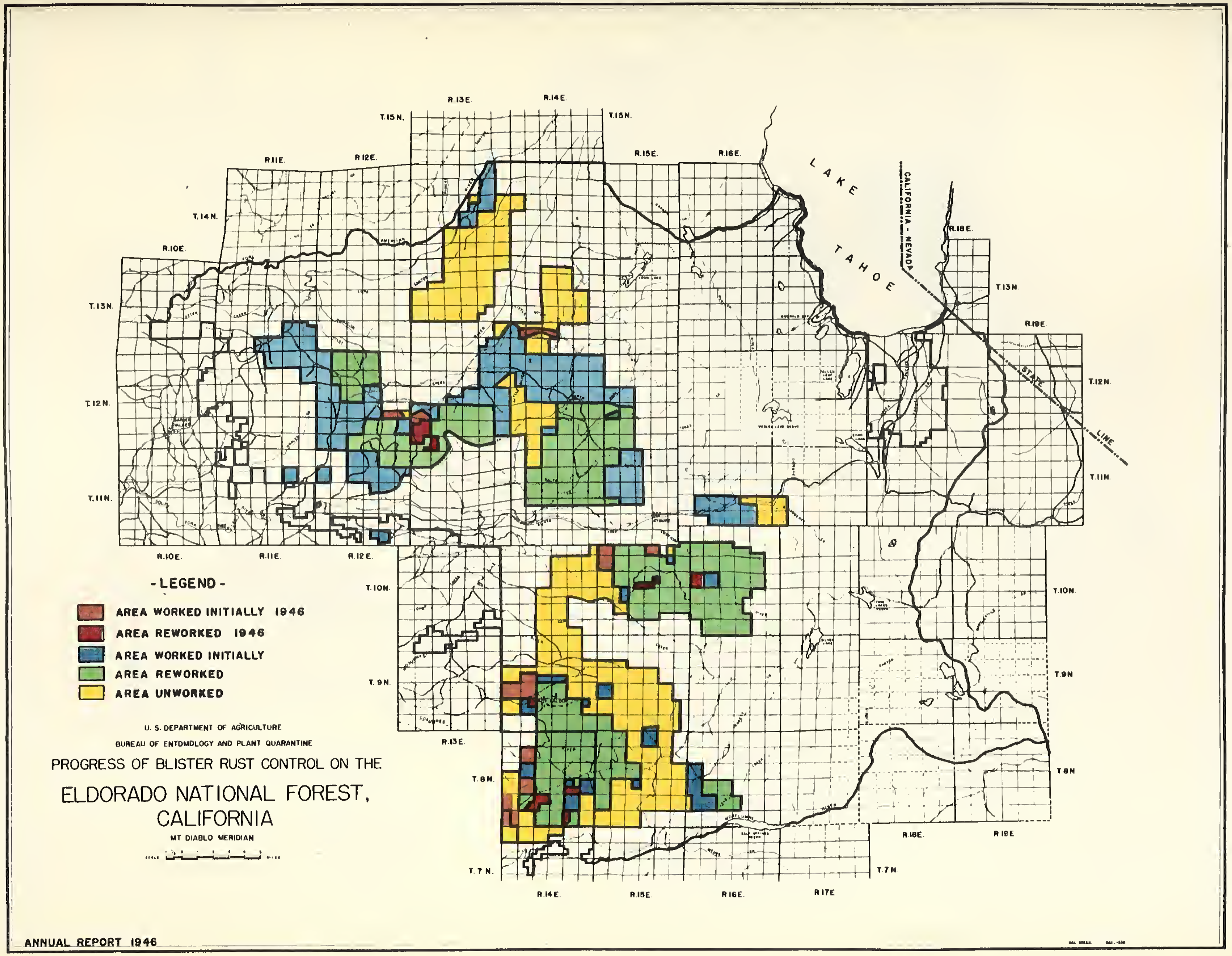
PROGRESS OF BLISTER RUST CONTROL ON THE
PLUMAS NATIONAL FOREST
MT DIABLO MERIDIAN
HONEY LAKE
LAKE ALMANOR
LA PORTE
SIERRA CITY
CLIO
OROVILLE
ANNUAL REPORT 1946


LAKE TAHOE
CALIFORNIA - NEVADA
STATE LINE
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R.11E.
R.12E.
R.13E.
R.14E.
R.15E.
R.16E.
R.17E.
R.18E.
R.19E.
T.15N.
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- LEGEND -
AREA WORKED INITIALLY 1946
AREA REWORKED 1946
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AREA REWORKED
AREA UNWORKED
U. S. DEPARTMENT OF AGRICULTURE
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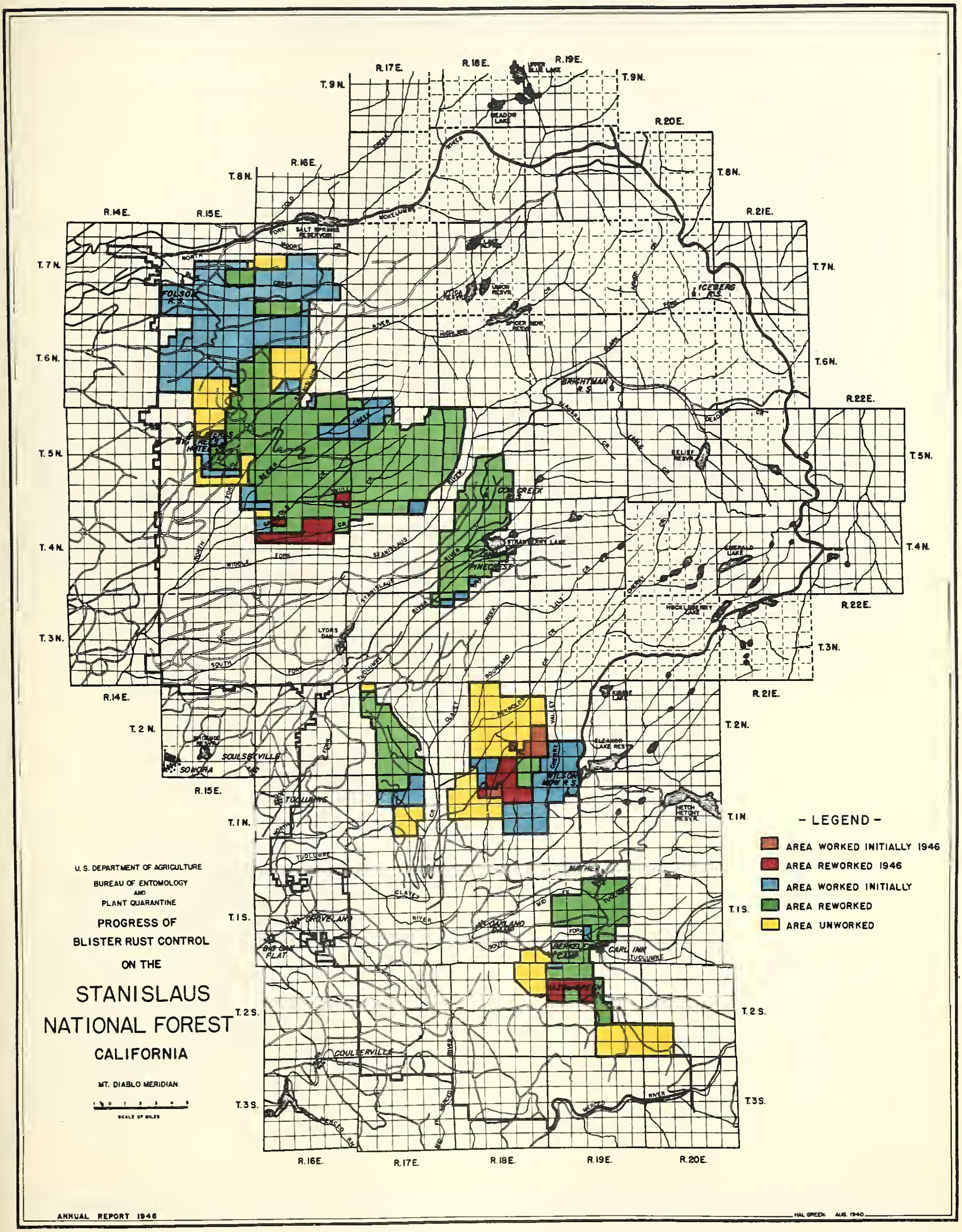
PROGRESS OF BLISTER RUST CONTROL ON THE
ELDORADO NATIONAL FOREST,
CALIFORNIA
MT DIABLO MERIDIAN
ANNUAL REPORT 1946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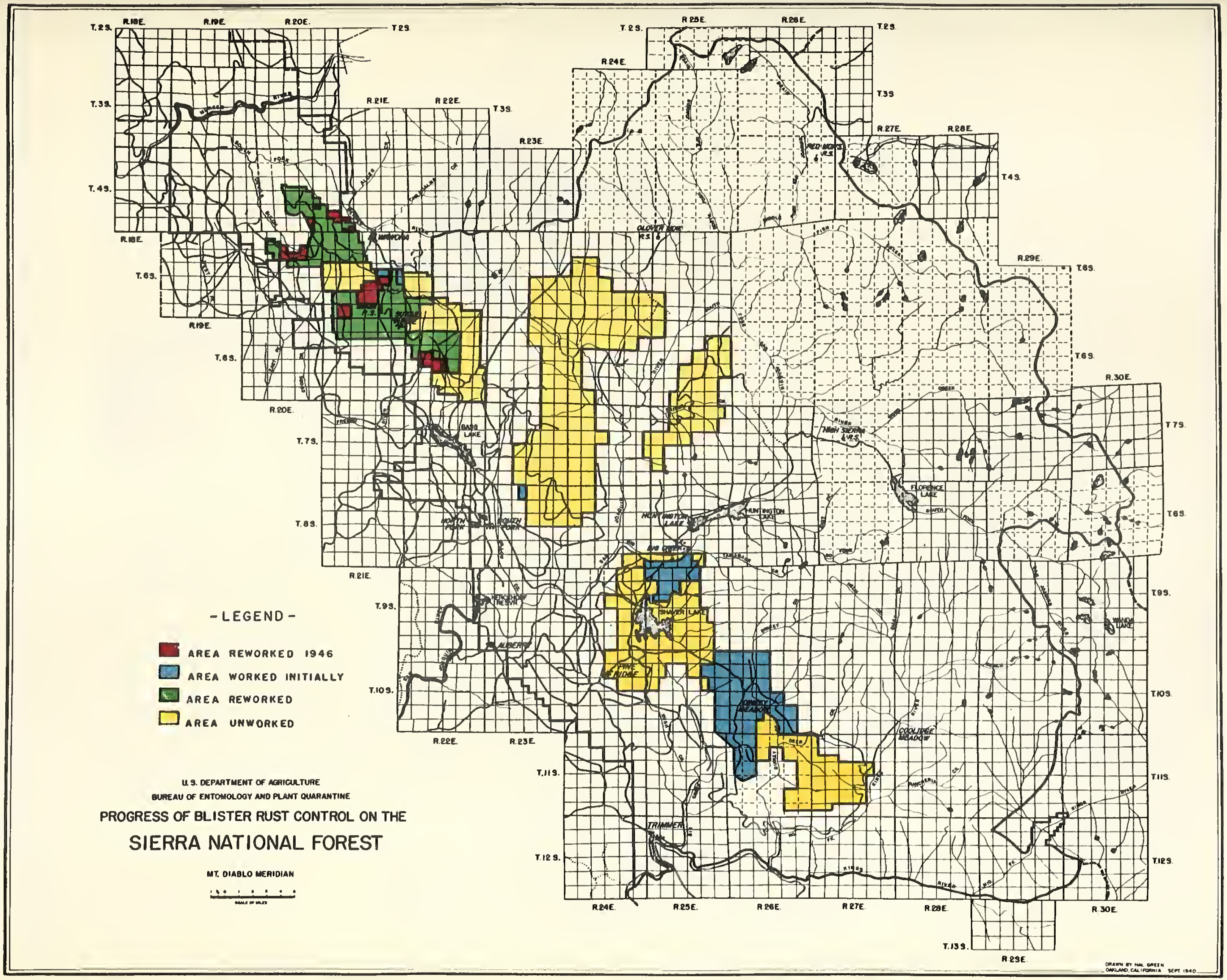
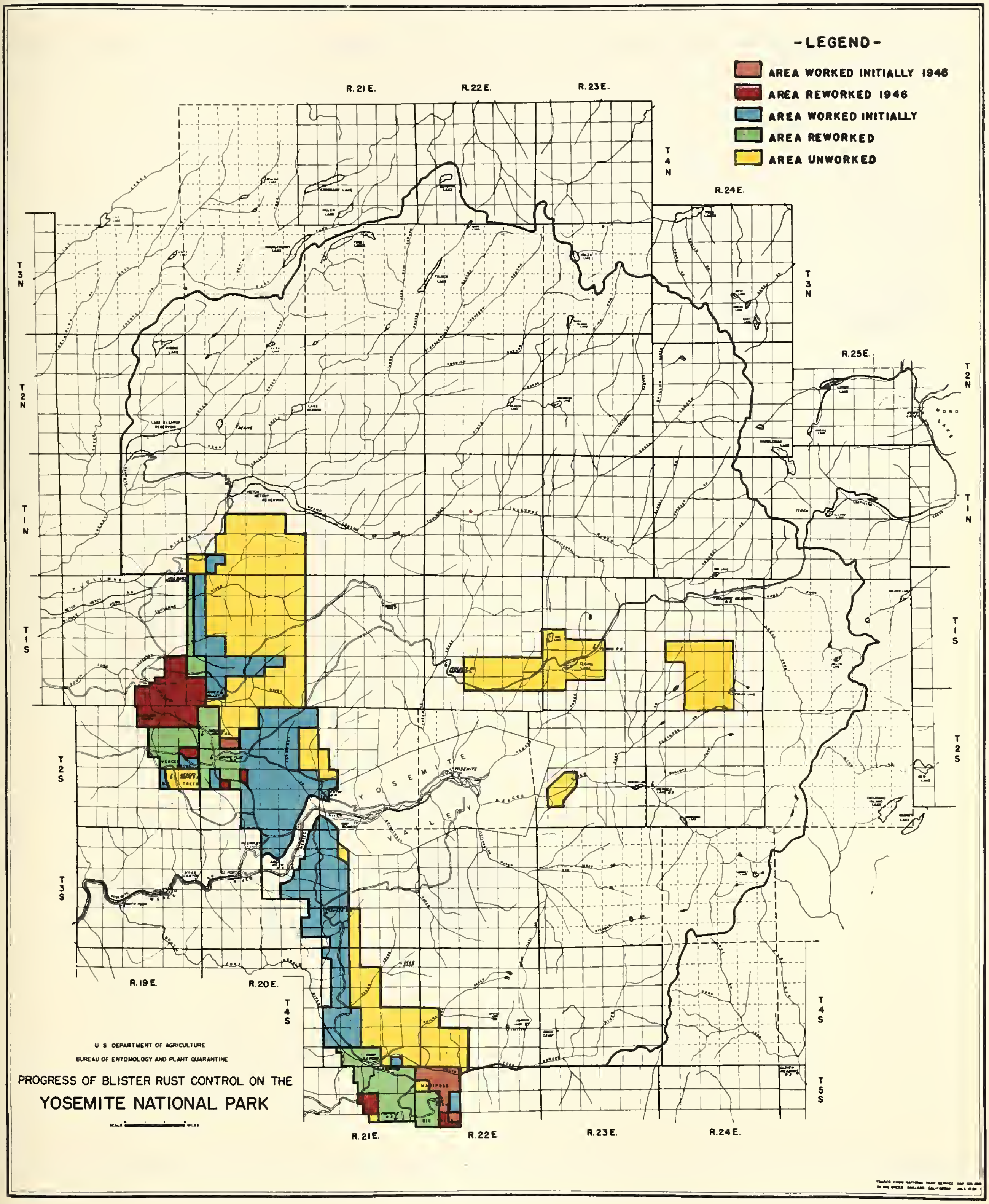
AND
PLANT QUARANTINE
PROGRESS OF
BLISTER RUST CONTROL
ON THE
STANISLAUS
NATIONAL FOREST
CALIFORNIA
MT. DIABLO MERIDIAN.
SCALE OF MILES
- LEGEND -
AREA WORKED INITIALLY 1946
AREA REWORKED 1946
AREA WORKED INITIALLY
AREA REWORKED
AREA UNWORKED
ANNUAL REPORT 1946
HAL GREEN AUG. 1940


- LEGEND -
AREA REWORKED 1946
AREA WORKED INITIALLY
AREA REWORKED
AREA UNWORKED
U.S. DEPARTMENT OF AGRICULTURE
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
PROGRESS OF BLISTER RUST CONTROL ON THE
SIERRA NATIONAL FOREST
MT. DIABLO MERIDIAN
WAWONA
BASS LAKE
HUNTINGTON LAKE
FLORENCE LAKE
SHAVER LAKE
PINE RIDGE
AUBERRY
TRIMMER
COOLIDGE MEADOW
DINKEY MEADOW
WARD LAKE
CLOVER MDW. R.S.
HIGH SIERRA R.S.
RED MDWS. R.S.
KINGS RIVER
DRAWN BY HAL GREEN
OAKLAND, CALIFORNIA SEPT 1940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AREA REWORKED 1946
AREA WORKED INITIALLY
AREA REWORKED
AREA UNWORKED
R. 21 E.
R. 22 E.
R. 23 E.
R. 24 E.
R. 25 E.
R. 19 E.
R. 20 E.
T 4 N
T 3 N
T 2 N
T 1 N
T 1 S
T 2 S
T 3 S
T 4 S
T 5 S
YOSEMITE VALLEY
U S DEPARTMENT OF AGRICULTURE
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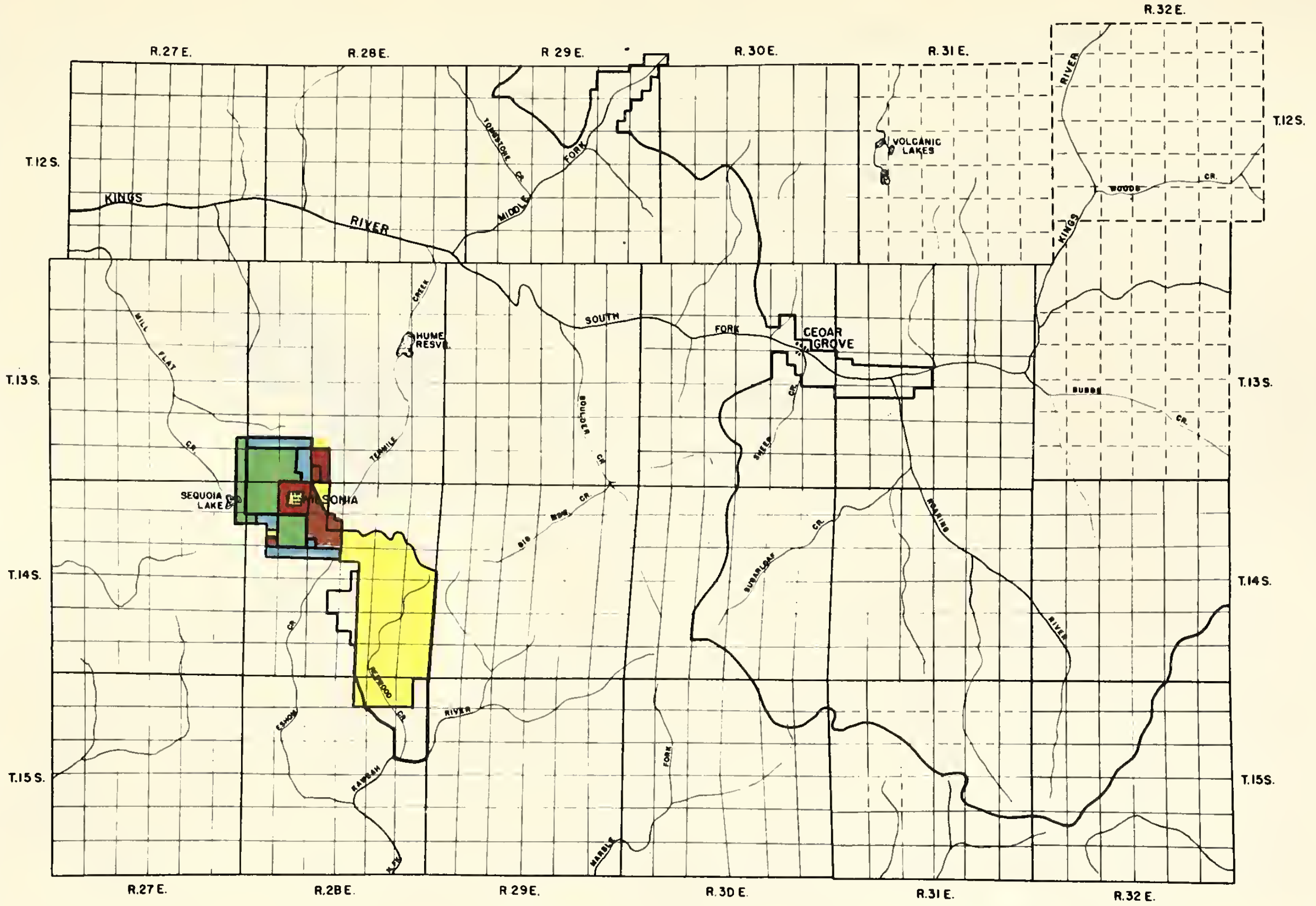
PROGRESS OF BLISTER RUST CONTROL ON THE
YOSEMITE NATIONAL PARK



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PROGRESS OF BLISTER RUST CONTROL ON THE
KINGS CANYON NATIONAL PARK

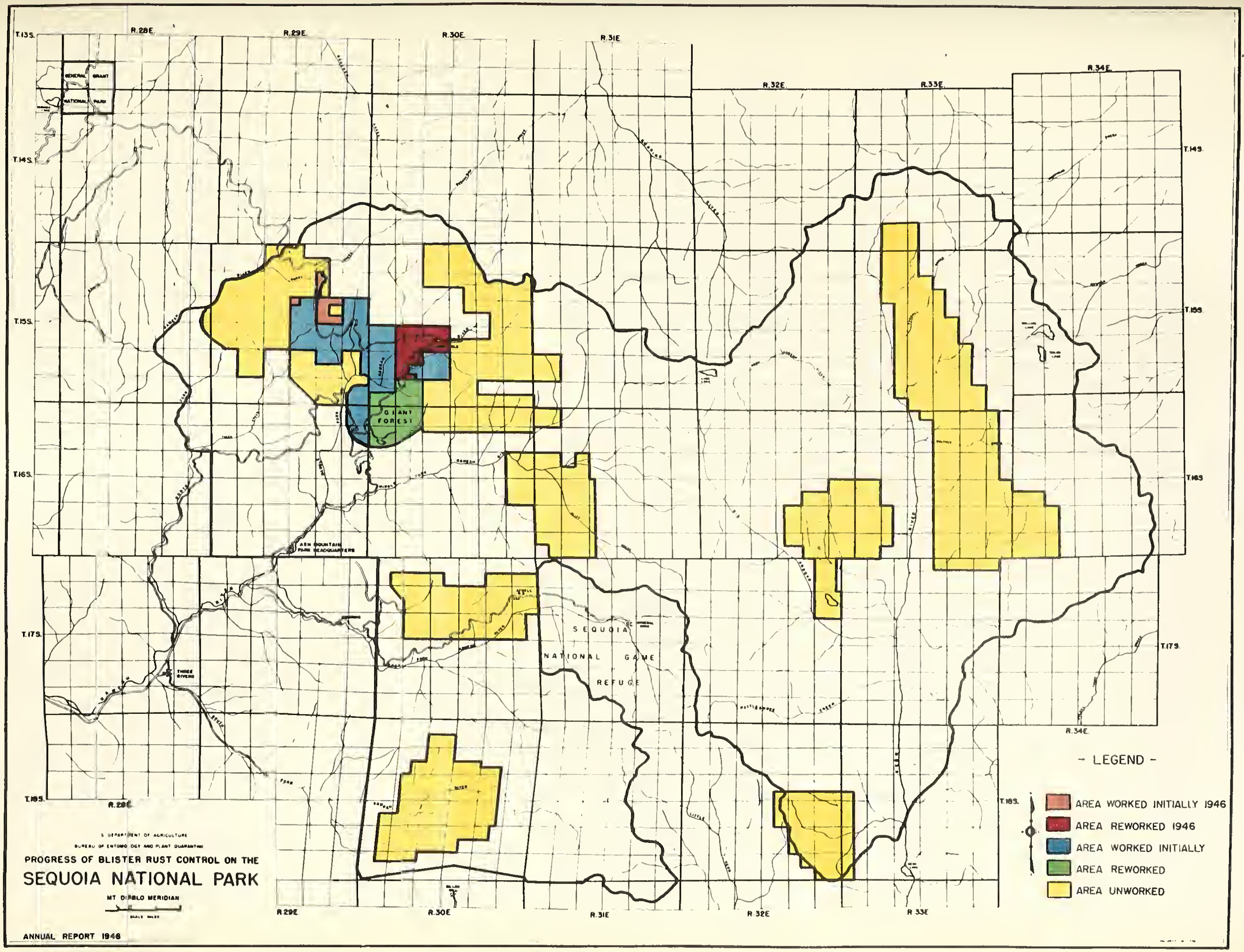
MT. DIABLO BASE & MERIDIAN

1 ½ 0 1 2 3 4 5
SCALE OF MILES

-LEGEND-

- AREA WORKED INITIALLY 1946
- AREA REWORKED 1946
- AREA WORKED INITIALLY
- AREA REWORKED
- AREA UNWORKED

E. ROSS ELLIS DEC. 1946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AREA REWORKED 1946
AREA WORKED INITIALLY
AREA REWORKED
AREA UNWORKED
GIANT FOREST
SEQUOIA NATIONAL GAME REFUGE
ASH MOUNTAIN PARK HEADQUARTERS
THREE RIVERS
GENERAL GRANT NATIONAL PARK
T.13S.
T.14S.
T.15S.
T.16S.
T.17S.
T.18S.
R.28E.
R.29E.
R.30E.
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PROGRESS OF BLISTER RUST CONTROL ON THE
SEQUOIA NATIONAL PARK
MT DIABLO MERIDIAN
ANNUAL REPORT 1946

PART III

COOPERATIVE BLISTER RUST CONTROL ON STATE AND PRIVATE LANDS

Work Project BLR-3-5

By

S. Daryl Adams, Agent, P-2

PURPOSE

The purpose of this project is the control of white pine blister rust in those sugar pine stands of California and Oregon which are growing on state and private lands.

COOPERATORS

The project, financed cooperatively by the Federal government, the states, and other interested agencies, both public and private, is operated under the leadership of the Bureau of Entomology and Plant Quarantine.

The State of California continued to cooperate in the control of white pine blister rust on state and privately owned sugar pine lands through its appropriation of $150,000 for the biennium ending June 30, 1947. The Division of Forestry of the California State Department of Natural Resources continued its cooperation in the control program by assigning 45 youths to the project from its Youth Authority camps located at Dew Drop and Whitmore.

The Diamond Match Company and the Michigan-California Lumber Company continued their participation in the project, each contributing $2,000. The Winton Lumber Company of Martell, Amador County, California, continued its participation by contributing $1,000.

The funds contributed by the State of California and by the private cooperators were matched with Federal funds. All cooperative control activities were confined to California.

LOCATION AND ORGANIZATION OF THE WORK

Areas to receive control treatment were selected according to the policy of giving first priority of work to areas on which recent logging has taken place and second priority to high rust hazard areas where blister rust is present or likely to become established in the near future.

During the 1946 season the Bureau operated 16 camps employing 815 men.

CAMPS ENGAGED IN COOPERATIVE RIBES ERADICATION DURING 1946

National Forest	Location of Camp	Size of Camp	Operating Period
Lassen	Hatchet Mountain	90	May 13 to Oct. 4
	Mill Creek	50	June 18 to Sept. 6
	Humbug	50	June 12 to Sept. 9
	Soda Springs	55	May 20 to Sept. 30
	Rag Dump	50	June 10 to Sept. 3
	Whitmore*	30	April 30 to Oct. 14
Plumas	American House	50	June 4 to Sept. 6
	Camel Peak	50	June 10 to Aug. 30
	Walter's Mine	55	May 7 to Oct. 9
Eldorado	China Flat	50	May 28 to Sept. 29
	Cold Spring	50	July 8 to Sept. 6
	Davis Cabin	50	May 14 to Sept. 27
	Pi Pi**	20	June 4 to June 30
	Dew Drop*	15	May 6 to Oct. 11
Stanislaus	Jawbone	50	May 6 to Sept. 30
	Fisher Creek	50	May 28 to Aug. 31
Sierra	Miami	50	June 11 to Sept. 6

*California State Division of Forestry Youth Authority camps.
**This Bureau crew was quartered in the Forest Service Blister Rust Control Camp at Pi Pi.

Ribes eradication was begun early in May; but due to the shortage of laborers the camps were not fully manned until late in June. One camp on the Eldorado was not opened until July 8.

The Bureau recruited all labor for its camps from high schools and through the U. S. Employment Service offices. Early spring contacts with the employment offices and Civil Service Commission indicated that many adult laborers would probably be available for our project. However, when the season started, adults were not interested in accepting seasonal employment and high school students were again the chief source of labor during the first part of the season. All available veterans were assigned as soon as their applications were received. Later replacements were made from transient labor centers. After August 1 many camps were not manned to full strength, since replacements were not available due to the competitive high wage rates offered by private industry. Delays in making salary payments were responsibile for many men quitting the project. In general, the quality of the labor was slightly above that of the war years.

Field supervisors were particularly difficult to obtain at the beginning of the season; however, the quality of this year's camp superintendents, foremen, and checkers was improved due to the return of war veterans, many having had previous blister-rust-control experience.

Wage rates for laborers were increased this year from \$0.724 per hour to \$0.882 per hour and for crewleaders from \$0.787 to \$0.970 per hour. Salaries of classified personnel remained unchanged during the spring period, but were increased 14 per cent on July 1.

Although food rationing, except for sugar, was not in effect this season more difficulty in the procurement of meats, bread, butter, flour, and shortening was encountered than during the rationing period of past seasons. The charge for subsistence made to field workers was increased this year from $1.41 per day to $1.56 per day.

The use of blister-rust-control crews for fire suppression duty was responsible for periodic interruptions in the progress of the field work. The per cent of total work days lost to fire fighting is shown in the following table.

SUMMARY OF MAN DAYS LOST TO FIRE SUPPRESSION
BY THE COOPERATIVE CREWS IN 1946

Operation	Man Days Lost Fighting Fires	Man Days on Ribes Eradication	Total Work Days	Per Cent of Total Work Days Lost to Fire Fighting
Lassen	2,298	10,445	12,743	18.0
Plumas	610	4,659	5,269	11.6
Eldorado	261	6,230	6,491	4.0
Stanislaus	413	4,346	4,759	8.7
Sierra	29	2,079	2,108	1.3
Totals	3,611	27,759	31,370	11.5

ACCOMPLISHMENTS

Lassen National Forest

Ribes Eradication in 1946

Camp	Acres Worked: Initial	Acres Worked: Reeradication	Acres Worked: Total	Man Days	Ribes Eradicated
Hatchet Mountain	2,855	-	2,855	3,103	475,571
Mill Creek	1,535	2,639	4,174	1,599	490,022
Humbug	160	1,280	1,440	1,152	108,741
Soda Springs	-	4,450	4,450	1,711	235,635
Rag Dump	1,707	-	1,707	1,333	101,767
Whitmore	3,758	-	3,758	1,547	70,441
Totals	10,015	8,369	18,384	10,445	1,482,177

During 1946 an effort was made to complete spot-work on areas of high rust hazard, to bring the reeradication work up to date, and to complete the over-all coverage of areas previously spot-worked. Approximately 20 per cent of the total acreage in the control units has now received initial treatment.

The Hatchet Mountain crews completed the over-all coverage of about 75 per cent of the 1943 spot-work area. Infection centers found in this area have been held in check through canker removal. A 50-man camp in this area in 1947 should be able to complete the over-all coverage of previous spot-work and complete the work on recently cut-over lands.

Mill Creek camp was again operated by a crew of school boys from the Tamalpais High School. All spot-work on this area was completed and reeradication work on recently logged-over areas on the Deer Creek unit was begun. This work will be completed from the Soda Springs camp in 1947.

The crews from the Humbug camp were engaged in reeradication treatment of areas initially worked in 1943 and 1944. In 1947 the remainder of the reeradication will be completed and initial work will begin on the adjoining recently cut-over land.

The Soda Springs crews carried on reeradication on areas originally worked in 1938 to 1940. More than half of this was third working since reeradication work had been done in 1942. The remaining 1,000 acres of reeradication work will be completed in 1947 and initial work will begin on the Colby Mountain unit which adjoins the Soda Springs area.

The spot-work on the Rag Dump area was completed this year and over-all coverage of the area was begun. The work will continue from this camp in 1947 and from a camp at Ramsey Bar, construction of which was started this fall. About three years' work on this unit remains for the two camps.

On April 30 training of a blister-rust-control crew was started at the California State Division of Forestry's Youth Authority camp at Whitmore. An agreement with the State provided that the State should furnish the men and foremen and the Bureau should furnish the transportation and technical direction. It was originally intended that 30 men should be assigned to ribes eradication, but this was not accomplished since the total camp strength was always too low. During August very little blister-rust-control work was accomplished since the entire camp was needed periodically to fight numerous State fires in the area. From August 1 to September 17 about 10 California Youth Authority boys at the Latour spike camp were engaged in ribes eradication under the supervision of a Bureau foreman. The spot-work begun on these camp areas this year should be completed in 1947.

Plumas National Forest

Ribes Eradication in 1946

Camp	Acres Worked Initial	Man Days	Ribes Eradicated
American House	1,972	1,307	176,530
Camel Peak	1,290	1,292	477,710
Walter's Mine	1,281	2,060	498,919
Totals	4,543	4,659	1,153,159

The American House camp crews completed the spot-working in the Lost Creek basin and completed the urgent initial eradication on all recently cut-over areas between the South Fork of the Feather River and Slate Creek. This camp will not operate in 1947. All spot-working on the forest has been completed.

From the Camel Peak and Walter's Mine camps the eradication of ribes in the Fall River drainage was continued. This area, which includes the

recently cut-over lands of the Feather River Pine Mills, was spot-worked in 1942. Ribes populations were heavy on all areas worked. These camps will operate in 1947 since a large amount of initial eradication remains to be done on this unit.

Chemical eradication work was begun on the Walter's Mine area where heavy populations of ribes on forty-seven acres were treated with 2,4-D spray.

A field office was established at Chico, California, from which the administration of the Plumas and Lassen camps was effected. Office space was made available through the courtesy of the Hall Scale Eradication project. This arrangement proved to be very satisfactory. A purchasing agent and clerk were employed to handle the procurement of subsistence and supplies for the operation. In October a warehouse building at the Fairgrounds (in Chico) was rented for the overwinter storage of the heavy items of camp equipment such as stoves, steel cots, tables, pipe, and lumber.

Eldorado National Forest

Ribes Eradication in 1946

Camp	Acres Worked: Initial	Acres Worked: Reeradication	Acres Worked: Total	Man Days	Ribes Eradicated
China Flat	1,535	896	2,431	2,215	600,004
Cold Spring	285	-	285	856	107,712
Davis Cabin	662	944	1,606	2,031	178,946
Pi Pi	-	1,030	1,030	413	29,982
Dew Drop	1,236	-	1,236	715	53,451
Totals	3,718	2,870	6,588	6,230	970,095

The China Flat camp, manned by high school boys and itinerant labor, was engaged in initial and reeradication work. The facilities of the Placerville Lumber Company at this camp were made available to the Bureau this season. Since the messhall and barracks were sufficient to accommodate the crew, further camp construction was unnecessary. A small crew is planned for this camp area in 1947 to continue the necessary reeradication work.

The Cold Spring camp, manned entirely by high school boys, continued the initial work on lands owned by the Michigan-California Lumber Company. Work was done on this area in 1945; but some portions were left in an unsatisfactory condition, due to the extremely heavy original ribes populations. In 1947 the initial work on this area will be continued and reeradication work will be conducted on 3,000 acres of 1942 work.

The Davis Cabin camp, manned principally by high school boys, devoted the season to initial and reeradication work on cut-over lands owned by the Michigan-California Lumber Company. During 1947 reeradication work on cutover lands will be continued from this camp.

During June a crew of twenty Bureau men operating out of the Forest Service camp at Pi Pi, performed reeradication work on 1,030 acres of privately owned land. This camp was dismantled at the close of the season, since continued work in this area will be conducted from the Caldor camp.

The California State Division of Forestry assigned 15 boys to the blister-rust-control project from the Youth Authority spike camp at Dew Drop. An agreement with the State provided that the State should furnish the men and foremen and the Bureau should furnish the transportation and technical direction. A larger crew is expected in 1947 when initial ribes eradication will be continued on the privately owned lands in this area.

Stanislaus National Forest

Ribes Eradication in 1946

Camp	Acres Worked: Initial	Acres Worked: Reeradication	Acres Worked: Total	Man Days	Ribes Eradicated
Jawbone	575	3,331	3,906	2,662	823,025
Fisher Creek	-	2,936	2,936	1,684	138,589
Totals	575	6,267	6,842	4,346	961,614

The Jawbone camp was manned to half strength with adult labor on May 6. High school boys completed the labor complement during the school vacation period. The crews from the Jawbone camp completed the urgent reeradication work on the recently cut-over lands of the West Side Lumber Company. A portion of the small amount of remaining initial work was done also. The reestablishment of ribes bushes has been rapid on all areas disturbed by the logging operations. A number of additional workings will be necessary to suppress the ribes on the areas treated this year.

Chemical eradication work was begun on this area this season where heavy populations of ribes on 281 acres were treated with 2,4-D spray.

The Fisher Creek camp, manned with high school youths, operated only during the school vacation period. These crews were engaged in reeradication work on recently cut-over lands of the Pickering Lumber Company. The necessary reeradication work was completed in this area except for a small amount of spot-work remaining along roads and streams in some of the more recent cut-over areas. All initial work has been completed.

Since 86 per cent of the lands in State and private ownership on the Stanislaus National Forest have received initial treatment the remaining job is mainly one of doing the necessary reeradication work. Initial work on recently cut-over lands will be done as needed. The reeradication program is up to date except for the Dorrington unit and the small amount of work remaining at Fisher Creek.

Sierra National Forest

Ribes Eradication in 1946

Camp	Acres Worked Reeradication	Man Days	Ribes Eradicated
Miami	2,377	2,079	239,539

This season marks the first control work by the Bureau on the Sierra operation since 1939.

During the school vacation period the Miami camp was manned by student laborers. The crews were engaged entirely in reeradication work, most of which was performed on the Yosemite Mountain Ranch area. Work from this camp will continue in 1947 since about three seasons' reeradication work remains to be completed.

Checking

The major part of the checkers' time was spent on regular and post checking. Most of the regular check is up to date. Although the mean age of this season's checkers was somewhat higher than that of the war years, the quality of their work was not noticeably improved. Many checkers were unable to attain their maximum productiveness since they were available only during the short summer vacation between school semesters.

The complete results of the checking project are presented in table 3 which follows this section of the report.

Summary of Ribes Eradication on State and Private Lands in California

In 1946 the cooperative project expended 27,759 man days in destroying 4,806,584 ribes on 38,734 acres (initial and reeradication work). These figures include 151-3/8 man days spent in the chemical spray (2,4-D) treatment of 271,398 ribes on 328.2 acres.

The 1946 program continued to give priority to recently logged lands and to areas of high rust hazard where blister rust is present or likely to become established in the near future.

The initial eradication of ribes on state and private lands in California is 41 per cent complete as of December 31, 1946. Of the total 876,735 acres within the control unit boundaries, 513,380 acres remain unworked.

The season's results in detail, the status of cooperative funds as of December 31, 1946 and a summary of all control work on state and private land are presented in tables 1 to 7 which follow this text.

RECOMMENDATIONS

During recent years the blister-rust-control program has been unable to complete the required protective work on schedule, owing to the ever expanding logging activity and the southward advancement of the rust. The control work is lagging on many cut-over areas. The 1947 control program should (1) emphasize the importance of continued initial and reeradication work on areas where excessive regeneration of ribes is taking place due to recent logging, (2) complete the over-all coverage of areas that have been spot-worked, and (3) provide for continued eradication of ribes on high rust hazard areas.

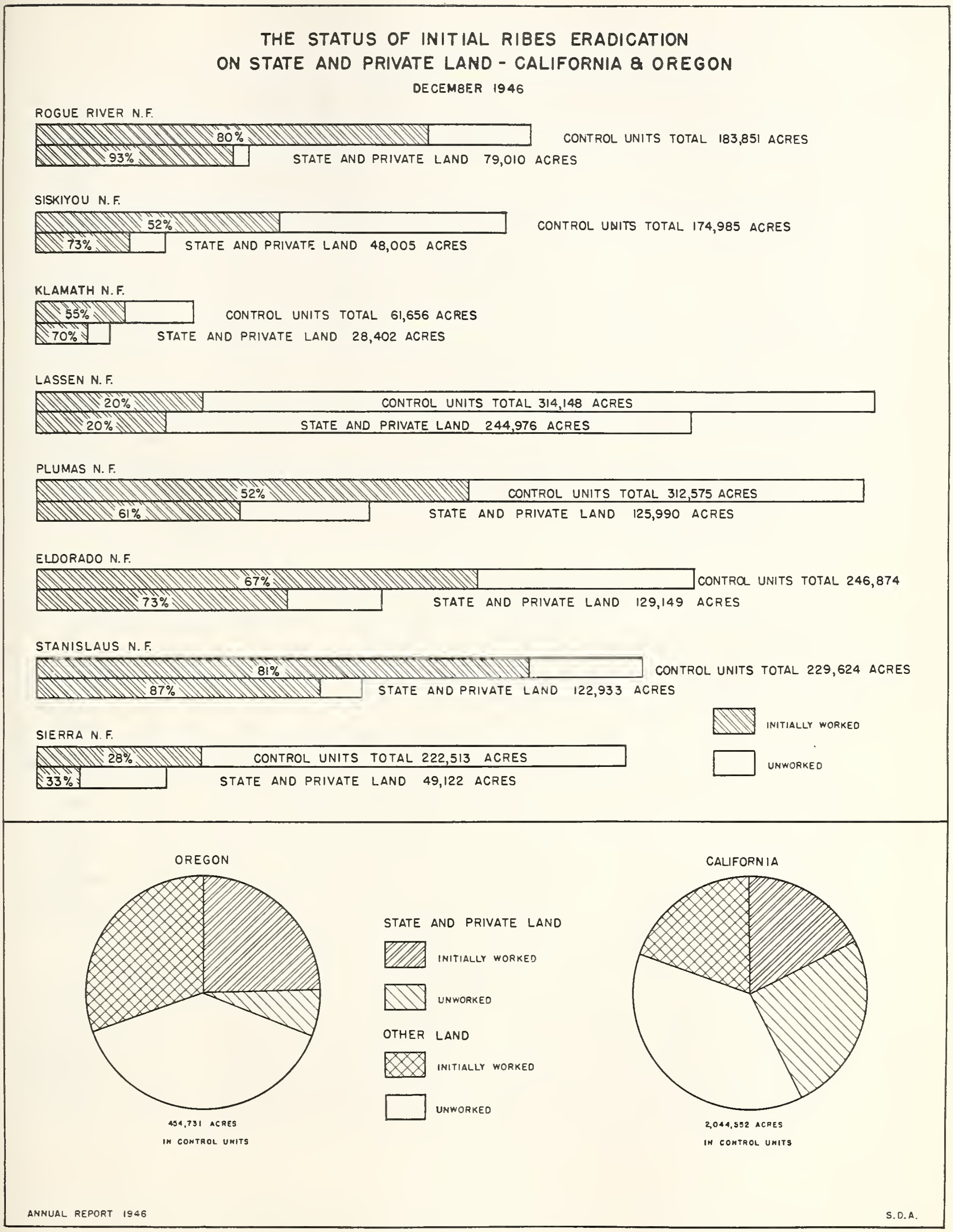

THE STATUS OF INITIAL RIBES ERADICATION
ON STATE AND PRIVATE LAND - CALIFORNIA & OREGON
DECEMBER 1946
ROGUE RIVER N.F.
80%
CONTROL UNITS TOTAL 183,851 ACRES
93%
STATE AND PRIVATE LAND 79,010 ACRES
SISKIYOU N.F.
52%
CONTROL UNITS TOTAL 174,985 ACRES
73%
STATE AND PRIVATE LAND 48,005 ACRES
KLAMATH N.F.
55%
CONTROL UNITS TOTAL 61,656 ACRES
70%
STATE AND PRIVATE LAND 28,402 ACRES
LASSEN N.F.
20%
CONTROL UNITS TOTAL 314,148 ACRES
20%
STATE AND PRIVATE LAND 244,976 ACRES
PLUMAS N.F.
52%
CONTROL UNITS TOTAL 312,575 ACRES
61%
STATE AND PRIVATE LAND 125,990 ACRES
ELDORADO N.F.
67%
CONTROL UNITS TOTAL 246,874
73%
STATE AND PRIVATE LAND 129,149 ACRES
STANISLAUS N.F.
81%
CONTROL UNITS TOTAL 229,624 ACRES
87%
STATE AND PRIVATE LAND 122,933 ACRES
INITIALLY WORKED
UNWORKED
SIERRA N.F.
28%
CONTROL UNITS TOTAL 222,513 ACRES
33%
STATE AND PRIVATE LAND 49,122 ACRES
OREGON
CALIFORNIA
STATE AND PRIVATE LAND
INITIALLY WORKED
UNWORKED
OTHER LAND
INITIALLY WORKED
UNWORKED
454,731 ACRES
IN CONTROL UNITS
2,044,552 ACRES
IN CONTROL UNITS
ANNUAL REPORT 1946
S.D.A.

TABLE 1

SUMMARY OF COOPERATIVE RIBES ERADICATION IN CALIFORNIA IN 1946

Control Operation	Acres			8-Hour Man Days	Ribes Eradicated	Per Acre Worked		Ownership Status									Acres Ribes-Free At Re-eradication
								Acres Covered			8-Hour Man Days			Ribes Eradicated			
	Worked	Blocked Out	Total			8-Hour Man Days	Ribes	Federal	Private	State	Federal	Private	State	Federal	Private	State	
Initial Work																	
Lassen National Forest	8,404	1,173	9,577	7,030	1,047,193	0.84	125	1,743	7,834		1,101	5,929		228,979	818,214		
Latour State Forest	238	200	438	83	8,438	0.35	35		364	74		69	14		7,012	1,426	
Plumas National Forest	3,896	647	4,543	4,659	1,153,159	1.20	296	1,082	3,461		1,227	3,432		220,619	932,540		
Eldorado National Forest	3,718		3,718	4,427	708,911	1.19	191	773	2,945		888	3,539		200,090	508,821		
Stanislaus National Forest	575		575	335	238,296	0.58	414	270	305		100	235		185,896	52,400		
Totals -	16,831	2,020	18,851	16,534	3,155,997	0.98	188	3,868	14,909	74	3,316	13,204	14	835,584	2,318,987	1,426	
Reeradication Work																	
Lassen National Forest	8,369		8,369	3,332	426,546	0.40	51	870	7,499		631	2,701		62,815	363,731		2,056
Eldorado National Forest	2,870		2,870	1,803	261,184	0.63	91	568	2,302		347	1,456		44,379	216,805		160
Stanislaus National Forest	6,267		6,267	4,011	723,318	0.64	115	910	5,357		812	3,199		199,859	523,459		1,020
Sierra National Forest	2,377		2,377	2,079	239,539	0.87	101	370	2,007		536	1,543		65,417	174,122		270
Totals -	19,883		19,883	11,225	1,650,587	0.57	83	2,718	17,165		2,326	8,899		372,470	1,273,117		3,506
All Workings																	
Lassen National Forest	16,773	1,173	17,946	10,362	1,473,739	0.62	88	2,613	15,333		1,732	8,630		291,794	1,181,945		2,056
Latour State Forest	238	200	438	83	8,438	0.35	35		364	74		69	14		7,012	1,426	
Plumas National Forest	3,896	647	4,543	4,659	1,153,159	1.20	296	1,082	3,461		1,227	3,432		220,619	932,540		
Eldorado National Forest	6,588		6,588	6,230	970,095	0.95	147	1,341	5,247		1,235	4,995		244,469	725,626		160
Stanislaus National Forest	6,842		6,842	4,346	961,614	0.64	141	1,180	5,662		912	3,434		385,755	575,859		1,020
Sierra National Forest	2,377		2,377	2,079	239,539	0.87	101	370	2,007		536	1,543		65,417	174,122		270
Totals -	36,714	2,020	38,734	27,759	4,806,584	0.76	131	6,586	32,074	74	5,642	22,103	14	1,208,054	3,597,104	1,426	3,506

TABLE 2

SUMMARY OF COOPERATIVE RIBES ERADICATION IN CALIFORNIA 1941-1946

Control Operation	Acres			8-Hour Man Days	Ribes Eradicated	Per Acre Worked		Ownership Status									Acres Ribes-Free At Re-eradication
								Acres Covered			8-Hour Man Days			Ribes Eradicated			
	Worked	Blocked Out	Total			8-Hour Man Days	Ribes	Federal	Private	State	Federal	Private	State	Federal	Private	State	
Initial Work																	
Lassen National Forest	21,220	1,173	22,393	19,991	3,507,602	0.94	165	5,857	16,536		4,566	15,425		976,931	2,530,671		
Latour State Forest	238	200	438	83	8,438	0.35	35		364	74		69	14		7,012	1,426	
Plumas National Forest	13,450	808	14,258	19,414	4,122,299	1.44	306	4,497	9,761		6,107	13,307		1,246,241	2,876,058		
Eldorado National Forest	13,737	430	14,167	12,434	1,856,708	0.91	135*	1,693	12,474		1,640	10,794		294,760	1,561,948		
Stanislaus National Forest	575		575	335	238,296	0.58	414	270	305		100	235		185,896	52,400		
Totals -	49,220	2,611	51,831	52,257	9,733,343	1.06	198	12,317	39,440	74	12,413	39,830	14	2,703,828	7,028,089	1,426	
Reeradication Work																	
Lassen National Forest	18,161		18,161	7,032	886,339	0.39	49	1,783	16,378		987	6,045		98,246	788,093		3,625
Plumas National Forest	547		547	85	18,304	0.16	33		547			85			18,304		
Eldorado National Forest	16,396		16,396	8,199	907,727	0.50	55	4,152	11,141	1,103	2,221	5,595	383	290,697	598,324	18,706	8,583
Stanislaus National Forest	21,790		21,790	10,101	1,469,570	0.46	67	2,712	19,078		1,241	8,860		236,988	1,232,582		2,915
Calaveras Big Trees State Park	1,125		1,125	466	22,525	0.41	20		75	1,050		20	446		722	21,803	390
Sierra National Forest	2,377		2,377	2,079	239,539	0.87	101	370	2,007		536	1,543		65,417	174,122		270
Totals -	60,396		60,396	27,962	3,544,004	0.46	55	9,017	49,226	2,153	4,985	22,148	829	691,348	2,812,147	40,509	15,783
All Workings																	
Lassen National Forest	39,381	1,173	40,554	27,023	4,393,941	0.69	112	7,640	32,914		5,553	21,470		1,075,177	3,318,764		3,625
Latour State Forest	238	200	438	83	8,438	0.35	35		364	74		69	14		7,012	1,426	
Plumas National Forest	13,997	808	14,805	19,499	4,140,603	1.39	296	4,497	10,308		6,107	13,392		1,246,241	2,894,362		
Eldorado National Forest	30,133	430	30,563	20,633	2,764,435	0.68	92	5,845	23,615	1,103	3,861	16,389	383	585,457	2,160,272	18,706	8,583
Stanislaus National Forest	22,365		22,365	10,436	1,707,866	0.47	76	2,982	19,383		1,341	9,095		422,884	1,284,982		2,915
Calaveras Big Trees State Park	1,125		1,125	466	22,525	0.41	20		75	1,050		20	446		722	21,803	390
Sierra National Forest	2,377		2,377	2,079	239,539	0.87	101	370	2,007		536	1,543		65,417	174,122		270
Totals -	109,616	2,611	112,227	80,219	13,277,347	0.73	121	21,334	88,666	2,227	17,398	61,978	843	3,395,176	9,840,236	41,935	15,783

TABLE 3

SUMMARY OF CHECKING ON THE COOPERATIVE PROJECT - 1946

Operation	Regular Check			Advance Check			Post Check			All Checks		
	Acres Covered By Final Check	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days	Acres Covered	Per Cent of Check	Man Days
Lassen	15,951	4.8	266.8	20,215	3.0	252.9	22,733	3.4	263.8	58,899	3.7	783.5
Plumas	3,614	3.9	64.6	7,111	3.3	113.4	-	-	-	10,725	3.5	178.0
Eldorado	6,389	4.5	102.8	3,521	2.9	35.9	19,576	3.6	266.0	29,486	3.7	404.7
Stanislaus	6,489	4.1	107.2	1,640	2.0	4.2	5,085	3.7	37.5	13,214	3.7	148.9
Sierra	1,512	5.0	37.0	-	-	-	1,920	3.6	35.5	3,432	4.2	72.5
Totals	33,955	4.5	578.4	32,487	3.0	406.4	49,314	3.5	602.8	115,756	3.7	1,587.6

TABLE 4

SUMMARY OF RIBES ERADICATION BY THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE 1925-1946*

Control Operation	Acres			8-Hour Man Days	Ribes Eradicated	Per Acre Worked		Ownership Status: Acres Covered					Ownership Status: 8-Hour Man Days					Ownership Status: Ribes Eradicated					Acres Ribes-Free At Re-eradication
	Worked	Blocked Out	Total			8-Hour Man Days	Ribes	Federal: National Forest	Federal: O & C	Federal: Total	Private	State	Federal: National Forest	Federal: O & C	Federal: Total	Private	State	Federal: National Forest	Federal: O & C	Federal: Total	Private	State	
Initial Work																							
California: Lassen N. F.	32,431	10,522	42,953	24,885	4,530,468	0.77	140	10,517		10,517	32,436		5,791		5,791	19,094		1,240,121		1,240,121	3,290,347		
Latour State Forest	238	200	438	83	8,438	0.35	35				364	74				69	14				7,012	1,426	
Plumas N. F.	74,496	16,801	91,297	58,995	13,534,413	0.79	182	26,110		26,110	65,147	40	18,261		18,261	40,713	21	4,076,502		4,076,502	9,453,291	4,620	
Eldorado N. F.	91,442	26,032	117,474	67,717	17,022,566	0.74	186	27,638		27,638	87,234	2,602	15,263		15,263	50,820	1,634	3,939,354		3,939,354	12,772,321	310,891	
Stanislaus N. F.**	123,935	9,231	133,166	59,026	19,660,781	0.48	159	25,685		25,685	107,074	407	9,690		9,690	49,207	129	2,506,834		2,506,834	17,137,179	16,768	
Calaveras Big Trees State Park	1,868		1,868	1,339	188,261	0.72	101				120	1,748				21	1,318				3,260	185,001	
Sierra N. F.	50,418		50,418	76,090	15,995,271	1.51	317	35,638		35,638	14,780		54,059		54,059	22,031		10,930,704		10,930,704	5,064,567		
Subtotals	374,828	62,786	437,614	288,135	70,940,198	0.77	189	125,588		125,588	307,155	4,871	103,064		103,064	181,955	3,116	22,693,515		22,693,515	47,727,977	518,706	
Oregon: Rogue River N. F.	70,413	70,039	140,452	46,630	15,798,559	0.66	224	65,155	5,394	70,549	69,903		38,574	1,154	39,728	6,902		14,493,637	196,371	14,690,008	1,108,551		
Siskiyou N. F.	20,918	36,926	57,844	10,789	761,516	0.52	36	6,662	19,539	26,201	31,343	300	1,646	3,920	5,566	5,180	43	94,865	174,417	269,282	483,906	8,328	
Klamath N. F.	4,275	293	4,568	6,489	533,529	1.52	125	3,739		3,739	829		4,607		4,607	1,882		419,719		419,719	113,810		
Nursery Sanitation	486	344	830	352	5,019	0.72	10				418	412				178	174				2,547	2,472	
Subtotals	96,092	107,602	203,694	64,260	17,098,623	0.67	178	75,556	24,933	100,489	102,493	712	44,827	5,074	49,901	14,142	217	15,008,221	370,788	15,379,009	1,708,814	10,800	
Totals	470,920	170,388	641,308	352,395	88,038,821	0.74	187	201,144	24,933	226,077	409,648	5,583	147,891	5,074	152,965	196,097	3,333	37,701,736	370,788	38,072,524	49,436,791	529,506	
Reeradication																							
California: Lassen N. F.	20,021		20,021	7,355	897,937	0.37	45	2,500		2,500	17,521		1,101		1,101	6,254		102,694		102,694	795,243		8,805
Plumas N. F.	20,096		20,096	11,069	1,311,269	0.55	65	6,369		6,369	13,727		3,094		3,094	7,975		377,216		377,216	934,053		5,346
Eldorado N. F.	39,437		39,437	21,954	2,104,645	0.56	53	10,845		10,845	27,489	1,103	5,745		5,745	15,826	383	632,467		632,467	1,453,472	18,706	9,358
Stanislaus N. F.***	74,673		74,673	31,790	6,526,999	0.43	87	27,632		27,632	47,041		11,648		11,648	20,142		3,124,287		3,124,287	3,402,712		9,733
Calaveras Big Trees State Park	1,340		1,340	492	27,317	0.37	20				75	1,265				20	472				722	26,595	390
Sierra N. F.	3,562		3,562	3,500	463,121	0.98	130	1,255		1,255	2,307		1,539		1,539	1,961		229,414		229,414	233,707		270
Subtotals	159,129		159,129	76,160	11,331,288	0.48	71	48,601		48,601	108,160	2,368	23,127		23,127	52,178	855	4,466,078		4,466,078	6,819,909	45,301	33,902
Oregon: Rogue River N. F.	33,142		33,142	7,517	939,462	0.23	28	20,950		20,950	12,192		5,664		5,664	1,853		766,931		766,931	172,531		8,191
Totals	192,271		192,271	83,677	12,270,750	0.44	64	69,551		69,551	120,352	2,368	28,791		28,791	54,031	855	5,233,009		5,233,009	6,992,440	45,301	42,093
All Workings																							
California: Lassen N. F.	52,452	10,522	62,974	32,240	5,428,405	0.61	103	13,017		13,017	49,957		6,892		6,892	25,348		1,342,815		1,342,815	4,085,590		8,805
Latour State Forest	238	200	438	83	8,438	0.35	35				364	74				69	14				7,012	1,426	
Plumas N. F.	94,592	16,801	111,393	70,064	14,845,682	0.74	157	32,479		32,479	78,874	40	21,355		21,355	48,688	21	4,453,718		4,453,718	10,387,344	4,620	5,346
Eldorado N. F.	130,879	26,032	156,911	89,671	19,127,211	0.69	146	38,483		38,483	114,723	3,705	21,008		21,008	66,646	2,017	4,571,821		4,571,821	14,225,793	329,597	9,358
Stanislaus N. F.	198,608	9,231	207,839	90,816	26,187,780	0.46	132	53,317		53,317	154,115	407	21,338		21,338	69,349	129	5,631,121		5,631,121	20,539,891	16,768	9,733
Calaveras Big Trees State Park	3,208		3,208	1,831	215,578	0.57	67				195	3,013				41	1,790				3,982	211,596	390
Sierra N. F.	53,980		53,980	79,590	16,458,392	1.47	305	36,893		36,893	17,087		55,598		55,598	23,992		11,160,118		11,160,118	5,298,274		270
Subtotals	533,957	62,786	596,743	364,295	82,271,486	0.68	154	174,189		174,189	415,315	7,239	126,191		126,191	234,133	3,971	27,159,593		27,159,593	54,547,886	564,007	33,902
Oregon: Rogue River N. F.	103,555	70,039	173,594	54,147	16,738,021	0.52	162	86,105	5,394	91,499	82,095		44,238	1,154	45,392	8,755		15,260,568	196,371	15,456,939	1,281,082		8,191
Siskiyou N. F.	20,918	36,926	57,844	10,789	761,516	0.52	36	6,662	19,539	26,201	31,343	300	1,646	3,920	5,566	5,180	43	94,865	174,417	269,282	483,906	8,328	
Klamath N. F.	4,275	293	4,568	6,489	533,529	1.52	125	3,739		3,739	829		4,607		4,607	1,882		419,719		419,719	113,810		
Nursery Sanitation	486	344	830	352	5,019	0.72	10				418	412				178	174				2,547	2,472	
Subtotals	129,234	107,602	236,836	71,777	18,038,085	0.56	140	96,506	24,933	121,439	114,685	712	50,491	5,074	55,565	15,995	217	15,775,152	370,788	16,145,940	1,881,345	10,800	8,191
Totals	663,191	170,388	833,579	436,072	100,309,571	0.66	151	270,695	24,933	295,628	530,000	7,951	176,682	5,074	181,756	250,128	4,188	42,934,745	370,788	43,305,533	56,429,231	574,807	42,093

*Includes work done by the Bureau on lands of all ownership.
**Includes 7,516 acres, 3,905 man days, and 1,217,951 ribes on lands worked by the Bureau of Entomology and Plant Quarantine now in Yosemite National Park.
***Includes 480 acres, 326 man days, and 298,657 ribes on lands worked by the Bureau of Entomology and Plant Quarantine now in Yosemite National Park.

TABLE 5

ACREAGE OF STATE AND PRIVATE LANDS WORKED BY ALL AGENCIES IN 1946
PACIFIC COAST REGION

Control Operation	First Working Acres	Second Working Acres	Other Workings Acres	All Workings Acres
Klamath	3,384	4,169	170	7,723
Lassen	7,834	3,335	4,164	15,333
Latour State Forest	438	-	-	438
Plumas	3,691	501	2,109	6,301
Eldorado	3,825	922	1,660	6,407
Stanislaus	305	2,889	2,468	5,662
Sierra	-	185	2,452	2,637
California Totals	19,477	12,001	13,023	44,501
Rogue River	640	169	95	904
Siskiyou	240	2,656	848	3,744
Oregon Totals	880	2,825	943	4,648
TOTALS	20,357	14,826	13,966	49,149

TABLE 6

ACREAGE OF STATE AND PRIVATE LANDS WORKED BY ALL AGENCIES AS OF DECEMBER 31, 1946
PACIFIC COAST REGION

Control Operation	First Working Acres	Second Working Acres	Other Workings Acres	Total Workings Acres
Klamath	19,030	6,196	170	25,396
Lassen	48,807	14,922	6,756	70,485
Latour State Forest	438	-	-	438
Lassen Volcanic	140	15	-	155
Plumas	76,198	33,940	13,280	123,418
Eldorado	94,280	43,654	10,349	148,283
Stanislaus	106,438	53,161	13,320	172,919
Calaveras Big Trees State Park	1,868	1,185	155	3,208
Sierra	16,156	6,830	2,772	25,758
California Totals	363,355	159,903	46,802	570,060
Rogue River	73,125	12,746	750	86,621
Siskiyou	34,871	2,936	848	38,655
Klamath	829	-	-	829
Clark McNary Nursery	830	-	-	830
McKinley Nursery	40	-	-	40
Oregon Totals	109,695	15,682	1,598	126,975
TOTALS	473,050	175,585	48,400	697,035

TABLE 7

STATUS OF COOPERATIVE FUNDS FOR RIBES ERADICATION ON STATE AND PRIVATE LANDS IN CALIFORNIA - JULY 1, 1941 TO DECEMBER 31, 1946

Cooperative Funds	Accumulative Cooperative Contributions and Federal Appropriations 7/1/41-6/30/47	Accumulative Expenditures 7/1/41-12/31/45	Expenditures Calendar Year 1946	Available Balances as of 1/1/47
State and Private Cash Contributions: State of California	$ 300,000	$147,191	$ 77,128	$ 75,681
Diamond Match Co.	10,000	6,052	2,180	1,768
Michigan-California Lumber Co.	10,000	7,057	889	2,054
Red River Lumber Co.*	4,000	4,000		
Winton Lumber Co.	2,000		1,000	1,000
Total	$ 326,000	$164,300	$ 81,197	$ 80,503
Federal Allotments (Project 3103.14) 1942 Fiscal Year	$ 14,625	$ 14,612		
1943 Fiscal Year	71,770	71,378		
1944 Fiscal Year	86,195	86,083		
1945 Fiscal Year	85,040	84,997		
1946 Fiscal Year	271,125	155,772	$114,772	
1947 Fiscal Year	583,000*		309,866	$273,134
Total (Project 3103.14)	$1,111,755	$412,842	$424,638	$273,134
Grand Total	$1,437,755	$577,142	$505,835	$353,637

*Red River Lumber Company contributed only for 1943 and 1944 fiscal years.

NOTE: Expenditures in the amount of $51,032.97 were made during 1946 for emergency fire suppression at the call of the State of California, Division of Forestry, and the U. S. Forest Service. Reimbursements were made by these agencies to the Bureau blister-rust-control funds in the amount of $15,732.66 from the State of California and $35,300.31 from the Forest Service. These amounts were credited back to the funds from which expended and are a part of the balances shown available for expenditure.

***$120,000 of this amount allotted for working of intermingled lands in state and private ownership.**

PART IV

BLISTER RUST CONTROL BY THE FOREST SERVICE

Financial Project BLR-4

By

Arthur London, Forester, P-3

PURPOSE

This program has been established for the protection from white pine blister rust of those stands of white pine timber growing on national forest lands.

COOPERATION

The cooperative agreements between the Bureau of Entomology and Plant Quarantine and Regions 5 and 6 of the Forest Service were continued. The working plan for the cooperative conduct of blister rust control by the Bureau and the Forest Service (based upon the Memorandum of Understanding between these two agencies dated April 19, 1937) can be found in the Annual Report for 1939. Due to the lack of experienced personnel the Forest Service of the Eldorado, Stanislaus, and Sierra National Forests requested the Bureau's technical supervisors to assist them with the field work and administration of the Forest Service camps on these forests.

The Regional Office of R-5 continued their agreement with the State Board of Corrections of California on the use of prison labor for conducting blister rust control and other forest improvement work.

ORGANIZATION AND LOCATION OF THE WORK

The Forest Service operated 5 camps in Oregon and 16 camps in California. Four camps in California were manned by inmates from San Quentin and Folsom penitentiaries and the remainder of the camps by high school boys plus a small percentage of transient labor.

Experienced supervisory personnel were scarce, and some of the camps were understaffed as to quantity as well as quality of supervision. Labor sources also were limited, the supply of labor being critical all season long. Only through a vigorous recruitment program conducted by the Bureau were the required number of laborers obtained to man the camps on some of the forests. Labor turnover in camps manned with high school boys was high, and many replacements were required to maintain even a semblance of a working force. Use of teen-agers in these camps could hardly be classed as satisfactory, and only a negligible scattering of veterans and older labor could be found that would accept temporary seasonal employment. Inexperience, coupled with high turnover, a short field season, and inexperienced supervisory personnel provided only mediocre production in these boys' camps. Prison labor proved better than teen-agers. Inmates were well equipped with the proper type of clothing and footwear, were better

able physically to do a full day's work over a much longer season, and the State's management of prison camps was greatly improved over that of former years.

Fire fighting demands, especially on the Plumas and Klamath National Forests, hampered the eradication program; loss of time amounted to almost 20 per cent for these two forests.

An innovation in blister-rust-control work in the Pacific Coast Region was established this year by R-6 of the Forest Service. Through the efforts of William Bates, member of the Supervisor's staff in charge of timber management, Rogue River National Forest, two small contracts totaling 170 acres were let for ribes eradication work on the Rogue River National Forest. Contractors covered an average of 3.77 acres per man day and destroyed a total of 3,328 ribes. In addition prescribed control standards of leaving not over eight feet of live stem per acre with no one ribes bush of over three feet remaining on areas worked were fulfilled. The results obtained are encouraging and demonstrate the practicability of contract work for blister rust control. This experiment has revealed a method which may result in cheaper and more effective control. The Rogue River National Forest staff intends to exploit contracting to the fullest extent during 1947.

Distribution of Forest Service Camps

National Forest	Location of Camp	Size of Camp	Type of Labor	Operating Period
		Oregon		
Rogue River	Union Creek	50	H.S. Boys	May 15 to Sept. 30
	Foster Creek	30	H.S. Boys	July 1 to Sept. 6
Siskiyou	Oregon Caves	50	H.S. Boys	June 1 to Sept. 6
	Kester's Cabin	15	H.S. Boys	July 1 to Aug. 10
		California		
Klamath	Hungry Creek	50	Prison	May 16 to Oct. 13
	Cinnabar Springs	50	H.S. Boys	June 20 to Sept. 6
	Beaver Creek	50	H.S. Boys	May 22 to Aug. 30
	Doggett Creek	50	Prison	May 24 to Sept. 30
	Finley Gulch	50	Prison	June 3 to Oct. 7
	Cottonwood	100	H.S. Boys	July 3 to Aug. 30
Plumas	Canyon Dam	50	H.S. Boys	June 12 to Sept. 18
	Granite Basin	50	H.S. Boys	July 2 to Aug. 28
	Big Bar	50	H.S. Boys	June 17 to Sept. 26
	Feather River	25	H.S. Boys	July 10 to Sept. 13
	Mooreville Ridge	50	Prison	June 10 to Oct. 14
Eldorado	Caldor	50	Transients	July 29 to Oct. 7
	Pi Pi	50	H.S. Boys	June 18 to Aug. 28
Stanislaus	Rush Creek	50	H.S. Boys	June 12 to Aug. 31
	Crane Meadows	50	H.S. Boys	June 25 to Sept. 10
Sierra	Soquel	50	H.S. Boys	June 19 to Sept. 6
	Summit	50	H.S. Boys	June 18 to Aug. 25

WORK PERFORMED AND RESULTS ACCOMPLISHED

Rogue River National Forest

Two camps manned with high school students were operated on the upper Rogue unit. The Union Creek camp fluctuated in size from 120 men to 40 men throughout the summer because of ceiling limitations and heavy turnover. The Foster Creek camp varied in labor strength from 40 to 20 men for the same reasons. In addition two small experimental contracts were let for ribes eradication work. They were successful and demonstrated conclusively the feasibility of contracting to private individuals. All operations continued urgent reeradication work where damage is or will be greatest. Accomplishments for 1946 are as follows:

Camp	Reeradication* Acres	Man Days	Ribes Destroyed
Union Creek	2,033	1,240	32,429
Foster Creek	787	639	11,779
Contract	170	45	3,328
Totals	2,990	1,924	47,536

*No initial work done.

Accomplishments fell far short of requirements. Systematic disease surveys reveal about three per cent of the sugar pine trees in the unit are infected with rust. The holding program initiated in 1943 and carried on through 1946 has succeeded in keeping damage to a minimum and reducing ribes populations to a uniformly low level. Nonetheless, sufficient rust is present and enough ribes remain to cause intensification of the disease during a year of favorable climatic conditions. A thorough cleanup job is needed and recommended.

As of December 31, 1946 a total of 82,991 acres in the upper Rogue unit has been given initial treatment; 48,993 acres of this has received reeradication treatment. Initial work, except for minor adjustments in boundaries, has been completed, but the reeradication job is behind schedule owing to the curtailed program of the war years and regeneration of ribes on areas disturbed by logging. About 8,000 acres of land supporting sugar pine, a high percentage of which has been logged, is urgently in need of a thorough reeradication job, and about 20,000 acres should be treated as soon as possible.

Siskiyou National Forest

One main camp of about 50 men was maintained at the Oregon Caves CCC camp for work on the Bolan Lake unit. Early in July a spike camp of 15 men was established and maintained until August 15 when the men were moved back to the main camp. Except for work in portions of three sections all operations were confined to reeradication of area treated previously. Accomplishments for 1946 are as follows:

Camp	Initial Work Acres	Reeradication Acres	Man Days	Ribes Destroyed
Oregon Caves	560	1,230	1,299	22,724

Heavy turnover in high school student labor and the loss of considerable time on fire fighting prevented the completion of the reduction of ribes populations to prescribed standards of control over the entire unit as had been planned. About 700 acres need further treatment and it is recommended that the job be contracted to private individuals during 1947. This will complete control work on the Bolan Lake unit except for small maintenance jobs on burned and logged areas.

Insofar as the Forest Service is concerned all initial blister-rust-control work on the Siskiyou National Forest has been completed unless the proposed Reuben Mountain operation is activated. Only the maintenance of the Bolan Lake unit will be required by the Forest Service as long as the Oregon and California Revested Lands Administration continues to assume responsibility of the maintenance work required on the Swede Basin and Bunker Hill Mine units.

Klamath National Forest

Six camps were operated during 1946, three of these being State prison camps and three being manned with high school boys.

Four camps were located in the Beaver Creek unit: Hungry Creek (prison), Finley Gulch (prison), Beaver Creek (boys), and Cottonwood (boys), the last being located in Oregon. All of these camps were employed primarily on second coverage of areas worked initially from 1939 to 1943 on which the rust was well established prior to initial working. Some initial work and some third eradication was accomplished by the Finley Gulch camp. Hungry Creek and Finley Gulch completed the work on areas accessible from these two locations. It is anticipated that work will continue from Beaver Creek and Cottonwood in 1947. The Beaver Creek unit is an area of excellent second growth of uneven age classes. The south end of the unit has been damaged by the rust, about five per cent of the sugar pine reproduction being infected and about two per cent being considered damaged. Regeneration of ribes is definitely on the down grade. Of the 8,563 reeradication acres in the unit inspected this year 2,680 acres or 31 per cent were found to be ribes-free after the initial working. It is recommended that the balance of reeradication work be completed as soon as possible to prevent any further reinfection and to preserve the remaining excellent sugar pine.

Two camps were located in the Cinnabar Springs unit. Doggett Creek (prison) was employed on initial eradication in virgin timber stands and some partially cut-over areas at the head of Dutch Creek and Doggett Creek drainages, and Cinnabar Springs (boys) was employed on second eradication in virgin timber stands around the headwaters of the West Fork of Beaver Creek. Doggett Creek camp should be reemployed in 1947 to complete initial eradication on recently logged areas of the Fruit Grower's Supply Company. Regeneration of Ribes lobbi is particularly heavy on these freshly disturbed areas. The Cinnabar Springs camp area can be deferred for several years or until such time as post checking indicates an increased ribes population. Infection in these stands of mature timber is negligible, and ribes populations for the most part, even in unworked areas, are extremely light, running from three to seven bushes per acre.

Eradication work remaining to be done in the above-mentioned units is confined to 5,200 acres of initial work, all in the Cinnabar unit, and 6,400 acres of urgent reeradication, all in the Beaver Creek unit. The present status of ribes eradication on the entire forest is illustrated graphically in the chart following the text. Accomplishments for 1946 are as follows:

Camp	Initial Work Acres	Reeradication Acres*	Man Days	Ribes Destroyed
Hungry Creek	28	2,512	3,228	73,233
Finley Gulch	1,300	1,662	3,461	103,147
Beaver Creek	279	989	1,489	62,719
Cottonwood	480	1,056	1,280	66,397
Doggett Creek	3,727	53	2,976	364,248
Cinnabar Springs	160	2,044	1,203	76,927
Totals	5,974	8,321	13,637	746,671

*Does not include acres ribes-free at time of reeradication.

Plumas National Forest

Five camps were operated by the Forest Service during 1946. The Mooreville Ridge camp was again manned with prison labor. Big Bar, Granite Basin, Canyon Dam, and Feather River were opened with high school boys and a few older men. Throughout the season replacements were made with transient labor.

The Canyon Dam camp was engaged in second and third eradication on areas initially worked from 1933 to 1936. Work on this area should continue in 1947. The Feather River camp worked two sections on the Thompson Creek area that were initially covered in 1935. This camp should operate again in 1947. Granite Basin and Big Bar work consisted of reeradication on 1940 and 1941 initial areas. Eradication on the Granite Basin area should continue in 1947.

The Big Bar reeradication area was completed this year. Initial eradication was continued on the Mooreville Ridge area. Heavy concentrations along roadsides were treated with 2,4-D. A number of ribes concentrations were set aside for 1947 chemical spray work.

In 1947 the control program should include the bringing up to date of scheduled reeradication on cut-over lands and continuing the initial eradication on the LaPorte unit.

The present status of control work on the Forest is shown on the accompanying chart, and the accomplishments of 1946 work in the tabulation below'

Camp	Initial Work Acres	Reeradication Acres	Man Days	Ribes Destroyed
Canyon Dam	-	3,012	1,844	167,879
Feather River	-	464	560	32,318
Granite Basin	75	1,211	869	116,991
Big Bar	-	1,545	1,176	66,476
Mooreville Ridge	1,060	-	2,764	604,559
Totals	1,135	6,232	7,213	988,223

Eldorado National Forest

The Forest Service operated two 50-man camps on the Caldor unit during 1946. The Caldor camp was manned with transient labor supplied through the U. S. Employment Service in Sacramento. The Pi Pi camp was manned with high school students for a relatively short period during the summer vacation period. Labor turnover in both camps was high and replacements were difficult to obtain.

Both camps conducted ribes eradication on cut-over lands heavy in ribes. More workings will be necessary on most of this area to maintain adequate protection from the rust.

Fire fighting demands were negligible, amounting to only two per cent of the total man days available for eradication.

The summary of 1946 work is as follows:

Camp	Initial Work Acres	Reeradication Acres	Man Days	Ribes Destroyed
Pi Pi - Caldor	3,008	440	2,759	455,442

Stanislaus National Forest

The Forest Service operated two 50-man camps on the Stanislaus National Forest during 1946, one located at Rush Creek and the other at Crane Meadows. High school students were used for labor in both camps, consequently the period of operation was only two months. Very little time was spent by either of these crews on fire suppression. Following the close of the camps a small crew was employed for the development and construction of three camps for next season.

The crews from the Rush Creek camp were employed on reeradication work on cut-over areas in the Hazel Green unit. The scheduled reeradication work was not completed this season and another camp should be assigned for this area in 1947.

From the Crane Meadows camp, located in the Jawbone unit, the crews were employed on the initial eradication of ribes from recently cut-over lands. Ribes populations were heavy and progress was slow; there is sufficient work to engage this camp for several seasons. With the heavy concentrations of ribes in this area a chemical spray project is planned for 1947.

The present status of control work on the forest is shown on the accompanying chart, and the accomplishments of the 1946 work appear in the figures below:

Camp	Initial Work Acres	Reeradication Acres	Man Days	Ribes Destroyed
Crane Meadows	1,626	-	1,432	274,340
Rush Creek	-	1,722	1,407	204,157
Totals	1,626	1,722	2,839	478,497

Sierra National Forest

The Forest Service operated two 50-man camps on the Sierra National Forest in 1946. Summit camp, located in the Chowchilla Mountain unit, was manned by high school students and was occupied the entire season on third and fourth workings of particularly heavy ribes-regeneration areas along Chowchilla Ridge. Soquel, located in the unit of the same name, was manned with high school students and engaged in second eradication of ribes from the Willow Creek drainage.

Labor turnover in both camps was very high throughout the season. Accomplishments for the year fell short of pre-season expectations primarily because of the large fluctuations in camp strength and the substandard quality of the student labor used.

Fire fighting demands on the camps accounted for five per cent of the total number of man days available for eradication. This is considerably better than it has been for several years past.

All eradication was by the group formation using swing crew and drag line. This method was developed in 1944 on the Sierra National Forest and used in 1945 and 1946 with satisfying results. The greater amount of direct supervision afforded by use of this method is appreciated when poor quality labor is involved.

Accomplishments for 1946 are as follows:

Camp	Reeradication Acres	Man Days	Ribes Destroyed
Summit	1,967	1,861	275,219
Soquel	1,380	1,532	419,040
Totals	3,347	3,393	694,259

The reeradication program on the Sierra National Forest is still considerably behind schedule. Present plans call for remanning both Summit and Soquel camps for the 1947 season. From the Summit camp location there is about 5,800 acres of urgent reeradication remaining to be done. This will take an estimated 3,900 man days. At Soquel there remains 2,600 acres of reeradication with an estimated expenditure of 2,000 man days. The reeradication required on the Sierra National Forest has been falling in arrears over the war years because of too few camps, insufficient overhead and labor, and short seasons. In addition to the above-mentioned two camps it is recommended that another reeradication camp be located on the north end of Chowchilla Ridge at Bear Wallow.

In the light of an expanded program and the development of 2,4-D as an herbicide spray for ribes it is recommended that initial work be started on the high priority sugar pine sites in the vicinity of Benedict Meadows.

Summary of Fire Fighting Activities

During the 1946 season the demands on blister rust crews for the suppression of forest fires were less than they have been for several years past. Forests in the northern end of the state had some difficult fires during

the latter part of the season. This was especially true of the Plumas. As a result those operations located in northern California bore the brunt of the fire-fighting demands upon the project and the resulting losses in man days to ribes eradication.

The following tabulation summarizes the man days spent by Forest Service blister-rust crews on fire fighting and the losses incurred by eradication work. Only those operations where fire-fighting records were kept are listed here.

Fire-Fighting Summary Forest Service Camps - 1946

Operation	Man Days on Eradication	Man Days on Fire Fighting	Man Days Actually Lost to Eradication	% of Total Available Man Days
Rogue River	1,957	362	271	12%
Klamath	13,637	5,015	2,810	17%
Plumas	7,213	4,406	1,905	21%
Eldorado	2,759	50	50	2%
Stanislaus	2,839	514	268	9%
Sierra	3,393	298	171	5%
Totals	31,798	10,645	5,475	15%

Checking

During 1946 approximately 70 man months were spent in checking on the Forest Service project. The checkers were supervised and paid by the Bureau and reimbursement claimed from the various forests. Regular checking kept pace with the eradication progress and a backlog of post and advance check was accomplished on most operations. A total of 82,015 acres was checked during the season.

Summary of Ribes Eradication

The 33,064 man days of labor expended by the Forest Service resulted in the destruction of 3,433,352 ribes on 12,303 acres of initial work and 24,282 acres of reeradication. The detailed results of the season's work and general summaries of all control work to date by the Forest Service are presented in tables 1 to 6 which follow this text. The seasonal summary by state of ribes eradication accomplished by the Forest Service during 1946 is as follows:

State	Initial Work Acres	Reeradication Acres	Man Days	Ribes Destroyed
Oregon*	1,319	5,415	5,283	182,206
California	10,984	18,867	27,781	3,251,146
Totals	12,303	24,282	33,064	3,433,352

*Includes R-5 work on the Klamath National Forest.

EXPENDITURES

During the calendar year of 1946 a total of $621,395 was expended on the Forest Service project. Of this amount $82,985 was spent in Oregon and $538,410 in California.

RECOMMENDATIONS

With increased allotments making possible an expansion in the scope of control work the program for 1947 should be aimed at regaining some of the ground lost during the war years. The planning for the immediate future should give consideration to:

1. Extensive use of 2,4-D chemical spraying on areas of heavy ribes concentrations located in high-priority sugar pine stands.

2. The possibility of contracting eradication work on areas of few and scattered ribes where most of the crews' time is spent in searching.

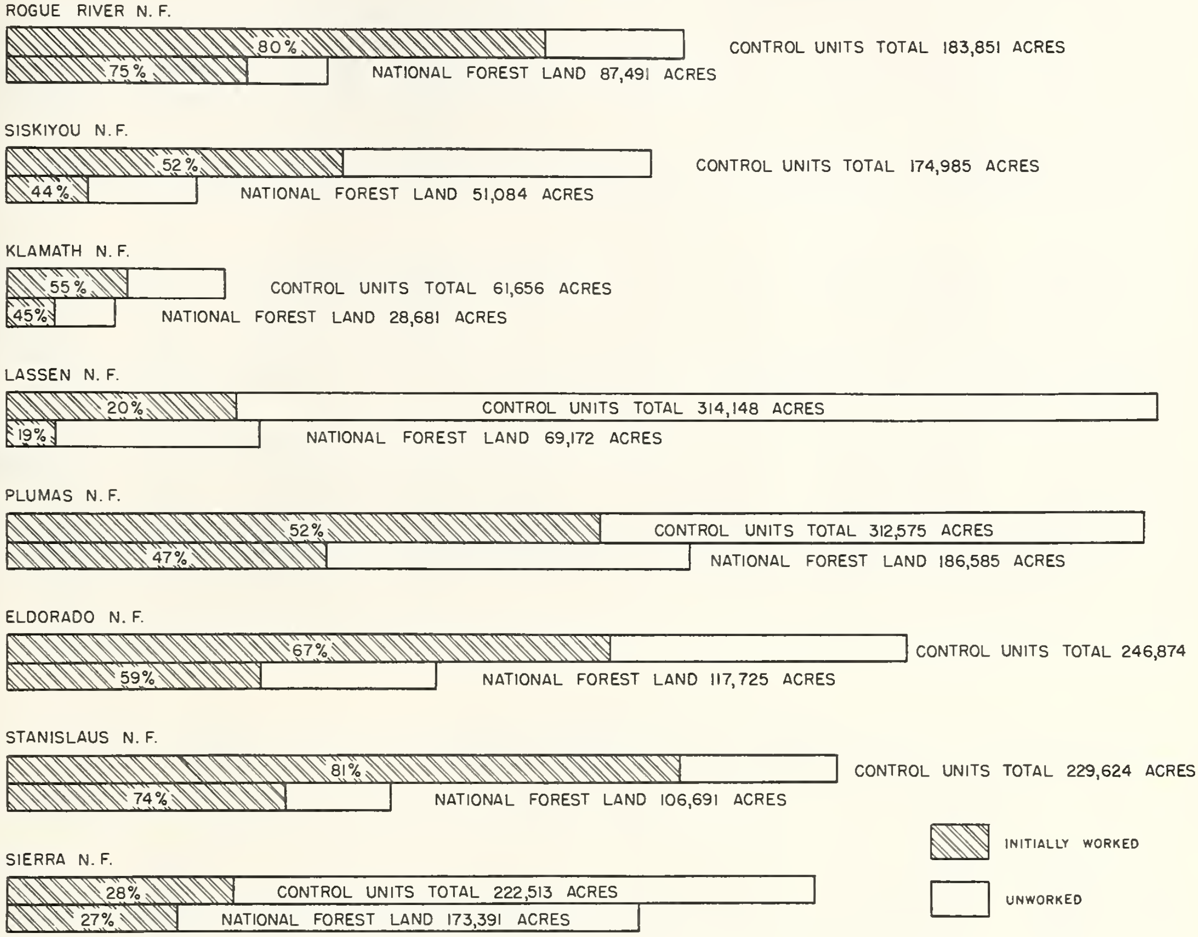
3. The necessity of eradication treatment of recently logged areas to be retained within the control units. Immediate steps should be taken to prevent a ribes-regeneration build-up that would ultimately increase any costs of control.

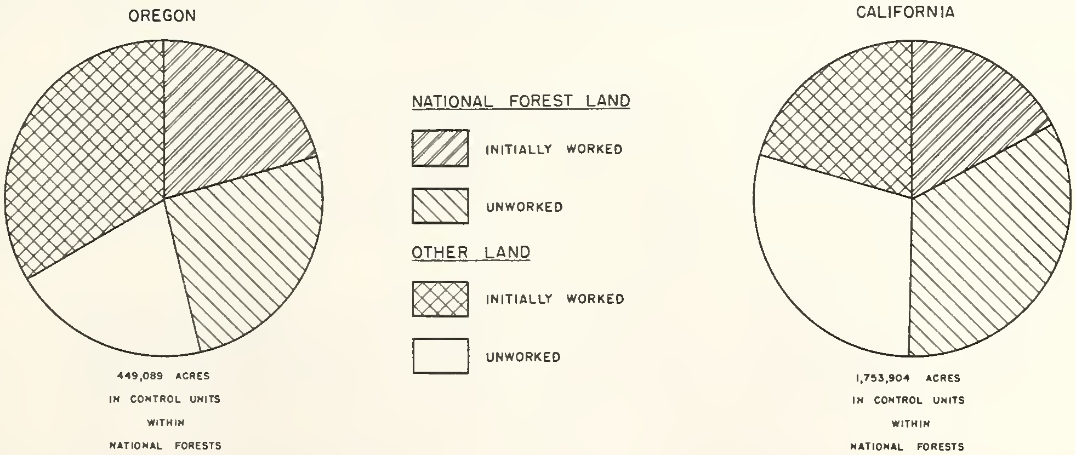
4. Completion of initial work on those areas within established control units where a loss of pine from the disease is already taking place.

5. Enlarging on reeradication work on those areas for which any further delay would increase the number of workings necessary to secure permanent ribes suppression.

THE STATUS OF INITIAL RIBES ERADICATION WITHIN NATIONAL FORESTS - CALIFORNIA & OREGON.

DECEMBER 1946





ANNUAL REPORT 1946

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TABLE 1

SUMMARY OF RIBES ERADICATION BY THE FOREST SERVICE IN 1946*

National Forest	Acres			8-Hour Man Days	Ribes Eradicated	Per Acre Worked		Ownership Status: Acres Covered				Ownership Status: 8-Hour Man Days				Ownership Status: Ribes Eradicated				Acres Ribes-Free At Re-eradication
	Worked	Blocked Out	Total			8-Hour Man Days	Ribes	Federal: National Forest	Federal: O & C	Federal: Total	Private	Federal: National Forest	Federal: O & C	Federal: Total	Private	Federal: National Forest	Federal: O & C	Federal: Total	Private	
Initial Work																				
California: Klamath	4,165	1,050	5,215	4,263	403,434	1.02	97	1,831		1,831	3,384	1,912		1,912	2,351	76,703		76,703	326,731	
Plumas	1,111	24	1,135	2,793	604,978	2.51	545	905		905	230	2,114		2,114	679	448,161		448,161	156,817	
Eldorado	3,008		3,008	2,533	431,790	0.84	144	2,128		2,128	880	1,947		1,947	586	333,813		333,813	97,977	
Stanislaus	1,566	60	1,626	1,432	274,340	0.91	175	1,626		1,626		1,432		1,432		274,340		274,340		
Subtotals	9,850	1,134	10,984	11,021	1,714,542	1.11	174	6,490		6,490	4,494	7,405		7,405	3,616	1,133,017		1,133,017	581,525	
Oregon: Siskiyou	378	182	560	383	8,428	1.01	22	240		240	320	190	12	202	181	3,373	467	3,840	4,588	
Klamath	759		759	1,266	86,563	1.67	114	480	279	759		736	530	1,266		55,314	31,249	86,563		
Subtotals	1,137	182	1,319	1,649	94,991	1.45	84	720	279	999	320	926	542	1,468	181	58,687	31,716	90,403	4,588	
Totals	10,987	1,316	12,303	12,670	1,809,533	1.15	165	7,210	279	7,489	4,814	8,331	542	8,873	3,797	1,191,704	31,716	1,223,420	586,113	
Reeradication																				
California: Klamath	7,126		7,126	7,314	231,291	1.02	32	2,787		2,787	4,339	3,226		3,226	4,088	145,245		145,245	86,046	2,524
Plumas	6,232		6,232	4,420	383,245	0.71	61	3,622		3,622	2,610	2,695		2,695	1,725	268,773		268,773	114,472	5,842
Eldorado	440		440	226	23,652	0.51	54	160		160	280	72		72	154	7,478		7,478	16,174	
Stanislaus	1,722		1,722	1,407	204,157	0.82	119	1,722		1,722		1,407		1,407		204,157		204,157		520
Sierra	3,347		3,347	3,393	694,259	1.01	207	2,717		2,717	630	2,958		2,958	435	663,962		663,962	30,297	270
Subtotals	18,867		18,867	16,760	1,536,604	0.89	81	11,008		11,008	7,859	10,358		10,358	6,402	1,289,615		1,289,615	246,989	9,156
Oregon: Rogue River	2,990		2,990	1,924	47,536	0.64	16	2,726		2,726	264	1,753		1,753	171	41,898		41,898	5,638	2,035
Siskiyou	1,230		1,230	916	14,296	0.74	12	360	840	1,200	30	330	563	893	23	2,818	11,329	14,147	149	621
Klamath	1,195		1,195	794	25,383	0.66	21	1,056	139	1,195		544	250	794		11,083	14,300	25,383		1,210
Subtotals	5,415		5,415	3,634	87,215	0.67	16	4,142	979	5,121	294	2,627	813	3,440	194	55,799	25,629	81,428	5,787	3,866
Totals	24,282		24,282	20,394	1,623,819	0.64	67	15,150	979	16,129	8,153	12,985	813	13,798	6,596	1,345,414	25,629	1,371,043	252,776	13,022
All Workings																				
California: Klamath	11,291	1,050	12,341	11,577	634,725	1.03	56	4,618		4,618	7,723	5,138		5,138	6,439	221,948		221,948	412,777	2,524
Plumas	7,343	24	7,367	7,213	988,223	0.98	135	4,527		4,527	2,840	4,809		4,809	2,404	716,934		716,934	271,289	5,842
Eldorado	3,448		3,448	2,759	455,442	0.80	132	2,288		2,288	1,160	2,019		2,019	740	341,291		341,291	114,151	
Stanislaus	3,288	60	3,348	2,839	478,497	0.86	146	3,348		3,348		2,839		2,839		478,497		478,497		520
Sierra	3,347		3,347	3,393	694,259	1.01	207	2,717		2,717	630	2,958		2,958	435	663,962		663,962	30,297	270
Subtotals	28,717	1,134	29,851	27,781	3,251,146	0.97	113	17,498		17,498	12,353	17,763		17,763	10,018	2,422,632		2,422,632	828,514	9,156
Oregon: Rogue River	2,990		2,990	1,924	47,536	0.64	16	2,726		2,726	264	1,753		1,753	171	41,898		41,898	5,638	2,035
Siskiyou	1,608	182	1,790	1,299	22,724	0.81	14	600	840	1,440	350	520	575	1,095	204	6,191	11,796	17,987	4,737	621
Klamath	1,954		1,954	2,060	111,946	1.05	57	1,536	418	1,954		1,280	780	2,060		66,397	45,549	111,946		1,210
Subtotals	6,552	182	6,734	5,283	182,206	0.81	28	4,862	1,258	6,120	614	3,553	1,355	4,908	375	114,486	57,345	171,831	10,375	3,866
Totals	35,269	1,316	36,585	33,064	3,433,352	0.94	97	22,360	1,258	23,618	12,967	21,316	1,355	22,671	10,393	2,537,118	57,345	2,594,463	838,889	13,022

*Includes work done by the Forest Service on lands of all ownership.

TABLE 2

SUMMARY OF RIBES ERADICATION BY THE FOREST SERVICE 1933-1946*

National Forest	Acres			8-Hour Man Days	Ribes Eradicated	Per Acre Worked		Ownership Status: Acres Covered				Ownership Status: 8-Hour Man Days				Ownership Status: Ribes Eradicated				Acres Ribes-Free At Re-eradication
	Worked	Blocked Out	Total			8-Hour Man Days	Ribes	Federal: National Forest	Federal: O & C	Federal: Total	Private	Federal: National Forest	Federal: O & C	Federal: Total	Private	Federal: National Forest	Federal: O & C	Federal: Total	Private	
Initial Work																				
California: Klamath	25,317	1,943	27,260	28,113	2,649,866	1.11	105	8,230		8,230	19,030	8,549		8,549	19,564	1,049,574		1,049,574	1,600,292	
Lassen	17,688	1,399	19,087	16,936	1,941,142	0.96	110	2,716		2,716	16,371	2,268		2,268	14,668	302,147		302,147	1,638,995	
Plumas	62,869	9,261	72,130	68,900	11,402,586	1.10	181	61,119		61,119	11,011	48,036		48,036	20,864	8,520,492		8,520,492	2,882,094	
Eldorado	41,511	5,119	46,630	28,554	7,400,365	0.69	178	42,186		42,186	4,444	21,070		21,070	7,484	6,161,174		6,161,174	1,239,191	
Stanislaus**	50,977	9,181	60,158	33,554	8,114,274	0.66	159	53,365		53,365	6,793	24,687		24,687	8,867	6,009,910		6,009,910	2,104,364	
Sierra	11,960	483	12,443	36,461	7,846,008	3.05	656	11,067		11,067	1,376	34,110		34,110	2,351	7,202,352		7,202,352	643,656	
Subtotals	210,322	27,386	237,708	212,518	39,354,241	1.00	187	178,683		178,683	59,025	138,720		138,720	73,798	29,245,649		29,245,649	10,108,592	
Oregon: Rogue River	772		772	1,058	130,629	1.37	169	772		772		1,058		1,058		130,629		130,629		
Siskiyou	5,075	5,244	10,319	5,820	210,745	1.15	42	6,275	2,118	8,393	1,926	4,361	971	5,332	488	171,194	25,326	196,520	14,225	
Klamath	1,806		1,806	3,285	290,262	1.82	162	876	930	1,806		1,711	1,574	3,285		116,834	173,428	290,262		
White Pine Plantation	145	535	680	373	124,744	2.57	860	680		680		373		373		124,744		124,744		
Subtotals	7,798	5,779	13,577	10,536	756,380	1.35	97	8,603	3,048	11,651	1,926	7,503	2,545	10,048	488	543,401	198,754	742,155	14,225	
Totals	218,120	33,165	251,285	223,054	40,110,621	1.02	184	187,286	3,048	190,334	60,951	146,223	2,545	148,768	74,286	29,789,050	198,754	29,987,804	10,122,817	
Reeradication																				
California: Klamath	10,189		10,189	9,601	291,083	0.94	29	3,823		3,823	6,366	4,016		4,016	5,585	185,179		185,179	105,904	2,714
Lassen	4,779		4,779	2,346	204,095	0.49	43	622		622	4,157	261		261	2,085	5,014		5,014	199,081	6,121
Plumas	75,577		75,577	45,379	5,258,148	0.60	70	42,084		42,084	33,493	26,171		26,171	19,208	2,726,951		2,726,951	2,531,197	30,235
Eldorado	56,671		56,671	32,760	2,478,621	0.58	44	31,260		31,260	25,411	19,369		19,369	13,391	1,265,409		1,265,409	1,213,212	10,251
Stanislaus	72,629		72,629	41,230	4,819,821	0.57	66	52,749		52,749	19,880	26,063		26,063	15,167	3,982,445		3,982,445	837,376	18,143
Sierra	46,703		46,703	35,755	10,948,303	0.77	234	39,408		39,408	7,295	31,324		31,324	4,431	10,038,836		10,038,836	909,467	1,250
Subtotals	266,548		266,548	167,071	24,000,071	0.63	90	169,946		169,946	96,602	107,204		107,204	59,867	18,203,834		18,203,834	5,796,237	68,714
Oregon: Rogue River	16,465		16,465	10,878	646,333	0.66	39	15,161		15,161	1,304	10,182		10,182	696	607,915		607,915	38,418	2,379
Siskiyou	1,230		1,230	916	14,296	0.74	12	360	840	1,200	30	330	563	893	23	2,818	11,329	14,147	149	621
Klamath	1,195		1,195	794	25,383	0.66	21	1,056	139	1,195		544	250	794		11,083	14,300	25,383		1,210
White Pine Plantation	212		212	228	29,957	1.08	141	212		212		228		228		29,957		29,957		395
Subtotals	19,102		19,102	12,816	715,969	0.67	37	16,789	979	17,768	1,334	11,284	813	12,097	719	651,773	25,629	677,402	38,567	4,605
Totals	285,650		285,650	179,887	24,716,040	0.63	87	186,735	979	187,714	97,936	118,468	813	119,301	60,586	18,855,607	25,629	18,881,236	5,834,804	73,319
All Workings																				
California: Klamath	35,506	1,943	37,449	37,714	2,940,949	1.06	83	12,053		12,053	25,396	12,565		12,565	25,149	1,234,753		1,234,753	1,706,196	2,714
Lassen	22,467	1,399	23,866	19,282	2,145,237	0.86	95	3,338		3,338	20,528	2,529		2,529	16,753	307,161		307,161	1,838,076	6,121
Plumas	138,446	9,261	147,707	114,279	16,660,734	0.83	120	103,203		103,203	44,504	74,207		74,207	40,072	11,247,443		11,247,443	5,413,291	30,235
Eldorado	98,182	5,119	103,301	61,314	9,878,986	0.62	101	73,446		73,446	29,855	40,439		40,439	20,875	7,426,583		7,426,583	2,452,403	10,251
Stanislaus	123,606	9,181	132,787	74,784	12,934,095	0.61	105	106,114		106,114	26,673	50,750		50,750	24,034	9,992,355		9,992,355	2,941,740	18,143
Sierra	58,663	483	59,146	72,216	18,794,311	1.23	320	50,475		50,475	8,671	65,434		65,434	6,782	17,241,188		17,241,188	1,553,123	1,250
Subtotals	476,870	27,386	504,256	379,589	63,354,312	0.80	133	348,629		348,629	155,627	245,924		245,924	133,665	47,449,483		47,449,483	15,904,829	68,714
Oregon: Rogue River	17,237		17,237	11,936	776,962	0.69	45	15,933		15,933	1,304	11,240		11,240	696	738,544		738,544	38,418	2,379
Siskiyou	6,305	5,244	11,549	6,736	225,041	1.07	36	6,635	2,958	9,593	1,956	4,691	1,534	6,225	511	174,012	36,655	210,667	14,374	621
Klamath	3,001		3,001	4,079	315,645	1.36	105	1,932	1,069	3,001		2,255	1,824	4,079		127,917	187,728	315,645		1,210
White Pine Plantation	357	535	892	601	154,701	1.68	433	892		892		601		601		154,701		154,701		395
Subtotals	26,900	5,779	32,679	23,352	1,472,349	0.87	55	25,392	4,027	29,419	3,260	18,787	3,358	22,145	1,207	1,195,174	224,383	1,419,557	52,792	4,605
Totals	503,770	33,165	536,935	402,941	64,826,661	0.80	129	374,021	4,027	378,048	158,887	264,711	3,358	268,069	134,872	48,644,657	224,383	48,869,040	15,957,621	73,319

*Includes work done by the Forest Service on lands of all ownership.
**Includes 690 acres, 1,672 man days, and 493,900 ribes worked by the Forest Service now in Yosemite National Park.

TABLE 3

SUMMARY OF CHECKING ON THE FOREST SERVICE PROJECT - 1946

Operation	Regular Check			Advance Check			Post Check			All Checks		
	Acres Covered By Final Check	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days
Oregon												
Rogue River	3,847	4.8	102.5	640	4.9	14.4	11,003	5.1	224.5	15,490	5.0	341.4
Siskiyou	2,656	5.3	89.4	-	-	-	2,661	5.1	66.6	5,317	5.2	156.0
Wind River	-	-	-	-	-	-	1,440	5.2	19.6	1,440	5.2	19.6
Totals	6,503	5.0	191.9	640	4.9	14.4	15,104	5.1	310.7	22,247	5.1	517.0
California												
Klamath	14,963	4.9	286.0	6,986	3.6	112.8	8,938	4.4	144.7	30,887	4.5	543.5
Plumas	5,637	4.3	101.1	1,745	2.2	12.3	24,365	4.3	400.6	31,747	4.2	514.0
Eldorado	1,350	3.4	32.3	3,278	2.3	19.7	2,032	3.3	13.8	6,660	2.8	65.8
Stanislaus	1,881	5.8	37.5	1,760	3.2	27.3	4,265	3.4	47.8	7,906	3.9	112.6
Sierra	2,664	4.9	84.9	-	-	-	2,151	3.8	46.3	4,815	4.4	131.2
Totals	26,495	4.8	541.8	13,769	3.1	172.1	41,751	4.2	653.2	82,015	4.2	1,367.1
Pacific Coast Region												
Totals	32,998	4.8	733.7	14,409	3.1	186.5	56,855	4.4	963.9	104,262	4.4	1,884.1

TABLE 4
(Omnibus Table 2 - Sheet 1)

ACREAGE WORKED ON NATIONAL FOREST LANDS 1946
PACIFIC COAST REGION

National Forests	First Working Acres	Second Working Acres	Other Workings Acres	All Workings Acres
Klamath	1,831	2,621	166	4,618
Lassen	1,743	490	380	2,613
Plumas	1,987	1,506	2,116	5,609
Eldorado	2,901	160	568	3,629
Stanislaus	1,896	1,055	1,577	4,528
Sierra		950	2,137	3,087
California Totals	10,358	6,782	6,944	24,084
Rogue River		1,278	1,448	2,726
Siskiyou	240	834	160	1,234
Klamath	480	1,056		1,536
Oregon Totals	720	3,168	1,608	5,496
Totals	11,078	9,950	8,552	29,580

TABLE 5
(Omnibus Table B - Sheet 1)

STATUS OF RIBES ERADICATION ON NATIONAL FOREST LANDS, DECEMBER 31, 1946
PACIFIC COAST REGION

National Forests	Total Acres		First Working		Second Working	Other Workings	On Maintenance*		Remaining Work	
	White Pine	Control Area	Acres	Per Cent	Acres	Acres	Acres	Per Cent	Unworked Acres	Requiring Rework Acres
Mendocino	21,017	21,017							21,017	
Trinity	122,575	122,575							122,575	
Klamath	19,650	19,650	8,230	42	3,657	166			11,420	
Shasta	3,611	3,611							3,611	
Lassen	69,172	69,172	13,233	19	2,542	580			55,939	
Plumas	186,585	186,585	87,229	47	39,474	8,979			99,356	
Tahoe	19,925	19,925							19,925	
Eldorado	117,725	117,725	69,824	59	35,937	6,168			47,901	
Stanislaus	106,691	106,691	78,680	74	50,742	29,599			28,011	
Sierra	173,391	173,391	46,705	27	26,291	14,372			126,686	
Sequoia	43,930	43,930							43,930	
California Totals	884,272	884,272	303,901	34	158,643	59,864	164,271	19	580,371	139,630
Rogue River	87,491	87,491	65,905	75	29,442	6,669			21,586	
Siskiyou	51,084	51,084	22,608	44	1,274	160			28,476	
Siuslaw	680	680	680	100	127	85				
Umpqua	60,353	60,353							60,353	
Klamath	9,031	9,031	4,615	51	1,056				4,416	
Oregon Totals	208,639	208,639	93,808	45	31,899	6,914	64,914	29	114,831	28,894
Totals	1,092,911	1,092,911	397,709	36	190,542	66,778	229,185	21	695,202	168,524

*These figures not changed from 1945 pending completion of study of problem of maintenance.

TABLE 6

SUMMARY OF RIBES ERADICATION BY AGENCY ON NATIONAL FOREST LAND 1925-1946

State	Acreage Of National Forest Land In Control Area	Calendar Year	Acreage Worked By: Forest Service Initial Work	Forest Service Reeradication	Forest Service Total	Bureau Initial Work	Bureau Reeradication	Bureau Total	O & C Initial Work	O & C Reeradication	O & C Total	Total Acreage Worked By All Agencies Initial Work	Total Acreage Worked By All Agencies Reeradication	Total Acreage Worked By All Agencies Total	Total Acreage According To Present Ownership (Initial Erad.)	Unworked Acreage
California	884,272	1926 to 1945	172,193	158,938	331,131	121,720	45,883	167,603				293,913	204,821	498,734	303,901*	580,371
		1946	6,490	11,008	17,498	3,868	2,718	6,586				10,358	13,726	24,084		
	Totals - - - -		178,683	169,946	348,629	125,588	48,601	174,189				304,271	218,547	522,818		
Oregon	208,639	1925 to 1945	7,861	12,647	20,508	78,165	22,676	100,841	9,671	440	10,111	95,697	35,763	131,460	93,808**	114,831
		1946	720	4,142	4,862					634	634	720	4,776	5,496		
	Totals - - - -		8,581	16,789	25,370	78,165	22,676	100,841	9,671	1,074	10,745	96,417	40,539	136,956		
Total Pacific Coast Region	1,092,911		187,264	186,735	373,999	203,753	71,277	275,030	9,671	1,074	10,745	400,688	259,086	659,774	397,709	695,202

*Excludes 370 acres now in Yosemite National Park.
**Excludes 2,609 acres of initial work in abandoned Mt. Hood unit.

PART V

BLISTER RUST CONTROL BY THE NATIONAL PARK SERVICE

Financial Project BLR-5

By

Frank A. Patty, Pathologist, P-3

PURPOSE

The purpose of this project is to protect from blister rust the white pine stands having aesthetic, recreational, and park values within the National Park boundaries.

COOPERATIVE AGREEMENTS

In 1945 the Department of Agriculture and the Department of the Interior formulated a broad working agreement vesting authority in their respective regions to develop and execute cooperative work programs to accomplish the maximum benefits at the least cost. Now only brief memoranda of agreement are needed between the regions of each agency. For the full text of the interdepartmental agreement see page 10 of the 1945 annual report.

ORGANIZATION AND LOCATION OF WORK

Seven blister-rust-control camps were located within the National Parks, five in Yosemite and two in Sequoia-Kings Canyon. The camps in Yosemite National Park were administered by Associate Regional Forester Maurice E. Thede until July 1, after which time Park Forester Emil F. Ernst, who had been on military furlough, assumed charge. Those in Sequoia-Kings Canyon were under Superintendent John R. White. Representatives of the Bureau gave technical supervision to the eradication and direct supervision to the checking work.

DISTRIBUTION OF PARK SERVICE CAMPS

Park	Location of Camp	Maximum Strength	Operating Period	Number Working Days	Average No. Men in Field Per Work Day
Yosemite	Carl Inn	50	June 18-Aug. 23	48	27
	Crane Flat	50	June 14-Sept. 13	63	21
	Sugar Pine Pass	50	July 10-Sept. 3	38	20
	Wawona*	100	May 3-Nov. 3	109	34
Sequoia-Kings Canyon	Red Fir	50	June 4-Aug. 23	58	27
	Cedar Springs	50	June 26-Aug. 28	45	30
Totals	6	350			

*Two 50-man units using same camp facilities at Wawona.

The camps were manned by 16 and 17 year old high school students most of whom were recruited by the Bureau. Yosemite National Park retained a number of its blister-rust-control foremen and superintendents on insect control, snow removal, camp construction, and other projects during the winter season of 1945-46. By holding these men, two experienced blister rust supervisors were available for each camp in the spring. In Sequoia-Kings Canyon National Parks high school teachers were used in most of the supervisory positions.

Sufficient funds to man three additional blister-rust-control camps were available to Yosemite National Park in 1946. Lumber and other building material were still not obtainable in the market. However, a number of portable buildings had been turned over to the National Park Service by the Army and Navy camps in the Park. These were dismantled and moved to the new camp sites. This semi-portable type of construction cost more than the ordinary portable camp. However, the camps will be occupied for four or five years so construction costs can be spread over that period.

The Park Service camps lost a negligible amount of time due to fire.

Yosemite National Park

RIBES ERADICATION 1946

Camp	Acres Worked		Man Days	Ribes
	Initial	Reeradication		
Carl Inn		2,459	1,280	26,595
Crane Flat	320	330	1,479	99,168
Sugar Pine Pass		400	845	188,461
Wawona	2,163	600	3,526	437,196
Yosemite Total	2,483	3,899	7,130	751,420

The Carl Inn camp was located on the South Fork of the Tuolumne River on the site of the old Carl Inn Resort. The mess hall was destroyed by fire shortly after the camp was manned resulting in the loss of one hundred man days in an already very short season. With the exception of 400 acres of logged-over land all of the area is mature timber. Efforts to suppress the ribes are beginning to show results for 3,083 acres were found to be ribes-free and did not require work by the crews. The Carl Inn camp will continue operating in the vicinity next season.

The buildings at Crane Flat were in such a bad state of repair that the Park Service decided to dismantle them. A new camp site in a much warmer and more desirable location was selected about a quarter of a mile from the old one, and a number of surplus Army and Navy buildings were set up. About half of the acreage covered from this camp was mature timber and the remainder old cut-over lands.

The Sugar Pine Pass camp, located a half-mile north of the Merced Grove of Big Trees, was the last one to be built. Ribes eradication work was started July 10. With the exception of the Merced Grove and a quarter-section of pure sugar pine timber north of the camp, the entire area has been badly denuded of timber by logging operations. However, an excellent stand of sugar pine reproduction as well as a heavy cover of brush now

occupies the ground. The heavy ribes population and the brush makes ribes eradication very difficult. The work area of the Sugar Pine Pass camp borders that of the Carl Inn and Crane Flat camps. There is sufficient work in sight to keep the camp operating for four or five years.

The camp at Wawona which had been occupying quarters in a dormitory building of the Wawona Hotel during the war moved to the old Wawona CCC camp. The camp had been given little maintenance care by an Army group that had taken it over and a considerable number of man days had to be expended cleaning up and reconditioning the buildings and the camp facilities. Two fifty-man blister rust units, each with its own superintendent and foremen, were located at Wawona. The ribes eradication data for the units were not kept separate.

Most of the work performed was initial work within the Mariposa Grove of Big Trees and adjacent lands. Only two hundred acres of initial work remain to be completed within the Mariposa Grove. Next year the crews will work mostly north of Wawona along the Wawona road.

In 1945 the National Park Service set up four super priorities within class A priorities, all of which were to have been completed before work was started on adjacent lands. However, additional funds allotted to Yosemite National Park in 1946 made it possible to work outside of these super priority groups this year.

The progress made to date and the work remaining in class A priority and its subdivisions are treated in the following tabulation.

STATUS OF RIBES ERADICATION ON CLASS A PRIORITY AREAS OF
YOSEMITE NATIONAL PARK

Area	Acres				
	Total	Initially Worked	Unworked	Reworked*	**Rework Required
Priority A-1					
Big Oak Flat Road	9,270	9,110	160	10,110	1,870
Mariposa Grove	3,000	3,000		2,560	1,180
Wawona Road	6,480	6,480			6,480
Total	18,750	18,590	160	12,670	9,530
Priority A-2					
Alder Creek	1,920	1,280	640		1,280
Total Priority A-1 & A-2	20,670	19,870	800	12,670	10,810
Priority A-3	56,730	36,664	20,066	13,441	18,840
Total Class A Area	77,400	56,534	20,866	26,111	29,650

*Includes second and third workings and acres found to be ribes-free at time of eradication.

**Post check will show that part of this acreage will be ribes-free and not need rework.

RIBES ERADICATION 1946

Camp	Acres Worked		Man Days	Ribes
	Initial	Reeradication		
Cedar Springs	833	654	1,361	199,533
Red Fir	610	1,224	1,576	109,270
Total	1,443	1,878	2,937	308,803

The camp at Cedar Springs in the General Grant Grove Section occupied the old CCC camp. All of the area treated was within the General Grant Grove Section or the adjacent protective strip. Only 203 acres of initial work remain to be completed in this unit. The heavy ribes population and the brush slowed down the progress of the crews. One additional season should complete most of the eradication in the Grant Grove Section but a little maintenance work will be necessary after that time.

The Red Fir camp had the largest personnel turnover of any blister rust camp in the National Park Service. This condition reflected in both the quantity and the quality of the work performed. The crews treated areas in the vicinity of Lodge pole and west of the camp along the General's Highway. There is sufficient work to keep the Red Fir camp operating for two or three years.

The progress made to date and the work remaining in class A priorities is shown in the following tabulation.

STATUS OF RIBES ERADICATION ON CLASS A PRIORITY AREAS OF SEQUOIA-KINGS CANYON NATIONAL PARKS

Area	Acres				
	Total	Treated Initially	Unworked	Reworked	Rework Required
Giant Forest Unit	21,100	12,415	8,685	4,457	4,824
General Grant Grove Unit	5,470	5,267	203	3,255	585
Redwood Mountain Unit	7,100		7,100		
Totals	33,670	17,682	15,988	7,712	5,409

Checking

The Yosemite checking organization consisted of ten men, a checker foreman, 3 senior checkers, and 6 checkers. The average length of service was 45 working days, and with a few exceptions the men did better work than has been done for several years. A total of 10,932 acres were checked--6,038 acres being regular check and 4,894 post check. The checking organization

for Sequoia-Kings Canyon National Parks consisted of 4 men who were on the job an average of 57 working days. A total of 6,982 acres were checked--3,043 acres being regular, 896 advance, and 3,034 acres post check. The quality of the work was good.

SUMMARY OF RIBES ERADICATION FOR THE NATIONAL PARK SERVICE PACIFIC COAST REGION

A total of 1,060,223 ribes were destroyed in 1946 from 9,330 acres (both initial and reeradication) with 10,067 man days required to do the job. In addition 3,870 acres were found to be ribes-free and did not require crew work. On the whole this was a satisfactory season except that the average number of men in the field per work day was too low as shown in the tabulation on page 76. Progress on the reeradication has been satisfactory in the Grant Grove Section of the Sequoia-Kings Canyon National Parks; on the contrary the Giant Forest area in Sequoia and much of Yosemite are behind schedule. Of the total of 286,195 acres within control unit boundaries 190,502 acres remain to be worked.

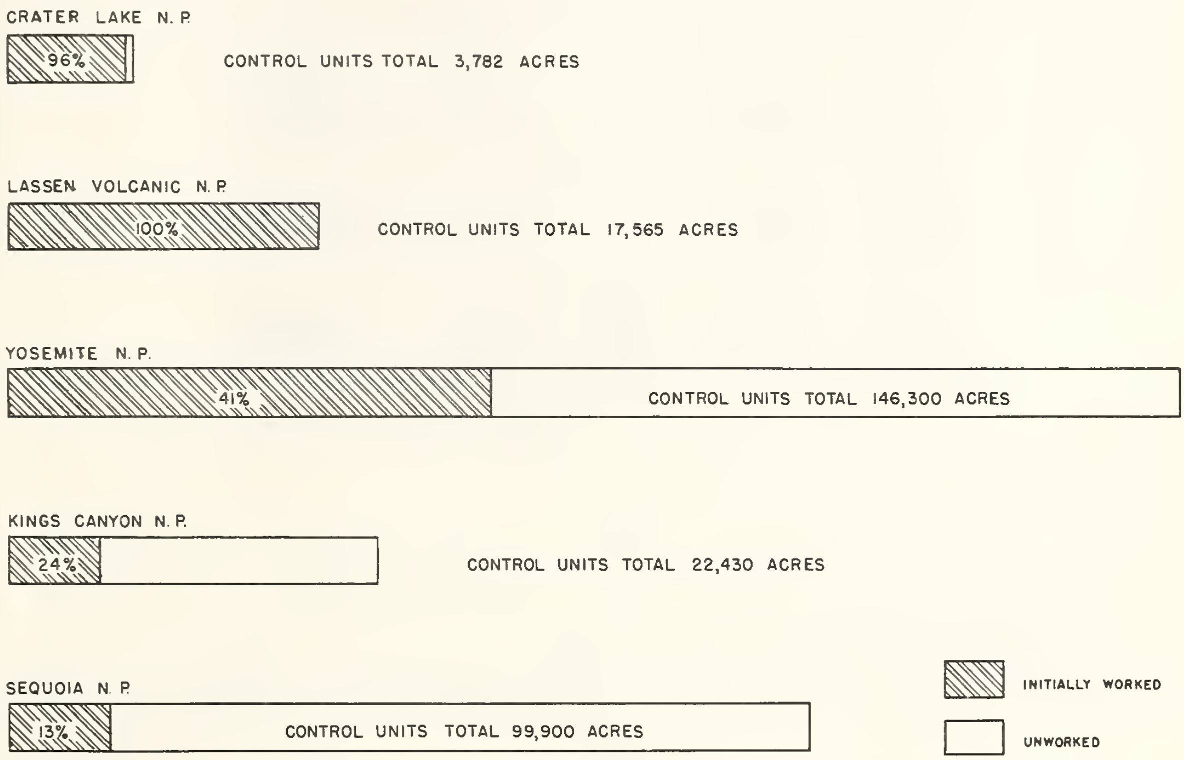
RECOMMENDATIONS

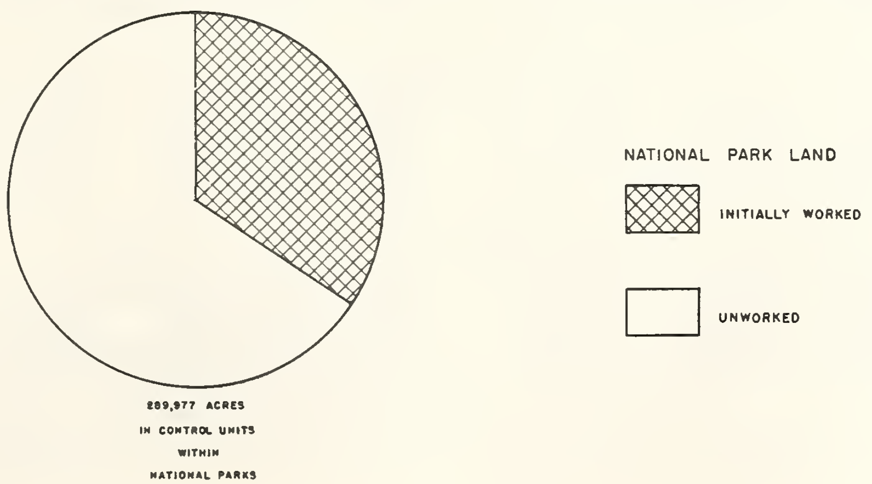
In Yosemite National Park six camp units are planned for 1947. Work has already started on the sixth camp located at Chinquapin. Emphasis should be placed on reeradication, especially within the A-1 priority units. The cut-over area near Crane Flat is a suitable place for a power spray operation.

In the General Grant Grove Section the remaining initial and rework should be cleaned up by a unit of 25 to 30 men working out of Cedar Springs camp. The Redwood Mountain camp, constructed in the fall of 1946, should continue where the Cedar Springs camp quit working in 1946. A portable spray outfit and about half a dozen backpack pumps can be used to advantage in this area. If two camps are located in the Giant Forest one unit should be at Red Fir and the other at the Marble Fork Bridge. Reeradication should be given highest priority in both camps.

A special effort should be made to keep every available field man digging ribes thereby increasing the number of men in the field for the season.

THE STATUS OF INITIAL RIBES ERADICATION
WITHIN NATIONAL PARKS - CALIFORNIA & OREGON
DECEMBER 1946





ANNUAL REPORT 1946 S. D. A.

TABLE 1

SUMMARY OF RIBES ERADICATION BY THE NATIONAL PARK SERVICE IN 1946*

National Park	Acres Worked**	8-Hour Man Days	Ribes Eradicated	Acres Ribes-Free At Re-eradication
		Initial Work		
Yosemite	2,483	3,129	386,787	
Kings Canyon	833	1,168	184,890	
Sequoia	610	1,124	81,474	
Totals -	3,926	5,421	653,151	
		Reeradication Work		
Yosemite	3,899	4,001	364,633	3,353
Kings Canyon	654	193	14,643	
Sequoia	1,224	452	27,796	517
Totals -	5,777	4,646	407,072	3,870
		All Workings		
Yosemite	6,382	7,130	751,420	3,353
Kings Canyon	1,487	1,361	199,533	
Sequoia	1,834	1,576	109,270	517
Totals -	9,703	10,067	1,060,223	3,870

*This table is also a summary of ribes eradication on National Park land in 1946 since all land worked by the Park Service was National Park land.

**No acres were blocked-out in 1946.

TABLE 2

SUMMARY OF RIBES ERADICATION BY THE NATIONAL PARK SERVICE 1933-1946*

National Park	Acres			8-Hour Man Days	Ribes Eradicated	Per Acre Worked		Ownership Status						Acres Ribes-Free At Re-eradication
								Acres Covered		8-Hour Man Days		Ribes Eradicated		
	Worked	Blocked Out	Total			8-Hour Man Days	Ribes	Federal	Private	Federal	Private	Federal	Private	
						Initial Work								
Crater Lake	406	3,226	3,632	412	130,162	1.01	321	3,632		412		130,162		
Lassen Volcanic	6,610	10,955	17,565	5,734	771,673	0.87	117	17,425	140	5,679	55	756,696	14,977	
Yosemite**	45,704	6,536	52,240	85,766	11,530,374			52,240		85,766		11,530,374		
Kings Canyon	5,267		5,267	7,665	1,179,592			5,267		7,665		1,179,592		
Sequoia	12,415		12,415	13,519	1,659,730			12,415		13,519		1,659,730		
Subtotals-Calif.	69,996	17,491	87,487	112,684	15,141,369			87,347	140	112,629	55	15,126,392	14,977	
Totals - - -	70,402	20,717	91,119	113,096	15,271,531			90,979	140	113,041	55	15,256,554	14,977	
						Reeradication Work								
Crater Lake	350		350	81	13,430	0.23	38	350		81		13,430		795
Lassen Volcanic	3,055		3,055	1,567	124,443	0.51	41	3,040	15	1,561	6	123,705	738	2,334
Yosemite***	22,700		22,700	27,321	3,288,157			22,700		27,321		3,288,157		7,650
Kings Canyon	3,255		3,255	2,171	227,876			3,255		2,171		227,876		
Sequoia	2,187		2,187	706	35,998			2,187		706		35,998		2,787
Subtotals-Calif.	31,197		31,197	31,765	3,676,474			31,182	15	31,759	6	3,675,736	738	12,771
Totals - - -	31,547		31,547	31,846	3,689,904			31,532	15	31,840	6	3,689,166	738	13,566
						All Workings								
Crater Lake	756	3,226	3,982	493	143,592			3,982		493		143,592		795
Lassen Volcanic	9,665	10,955	20,620	7,301	896,116			20,465	155	7,240	61	880,401	15,715	2,334
Yosemite	68,404	6,536	74,940	113,087	14,818,531			74,940		113,087		14,818,531		7,650
Kings Canyon	8,522		8,522	9,836	1,407,468			8,522		9,836		1,407,468		
Sequoia	14,602		14,602	14,225	1,695,728			14,602		14,225		1,695,728		2,787
Subtotals-Calif.	101,193	17,491	118,684	144,449	18,817,843			118,529	155	144,388	61	18,802,128	15,715	12,771
Totals - - -	101,949	20,717	122,666	144,942	18,961,435			122,511	155	144,881	61	18,945,720	15,715	13,566

*Includes work done by the Park Service on lands of all ownership.

**In addition 8,206 acres, 5,577 man days, and 1,711,851 ribes on lands worked by the Forest Service and the Bureau of Entomology and Plant Quarantine are now in Yosemite National Park.

***In addition 480 acres, 326 man days, and 298,657 ribes on lands worked by the Bureau of Entomology and Plant Quarantine are now in Yosemite National Park.

TABLE 3

THE STATUS OF RIBES ERADICATION IN THE NATIONAL PARKS OF THE PACIFIC COAST REGION BY PRIORITY CLASSES AS OF DECEMBER 31, 1946

National Park	Total All Classes Acres	CLASS A				CLASS B				CLASS C	
		Total Acres	Un-worked Acres	Initial Working Acres	Reerad-ication Acres	Total Acres	Un-worked Acres	Initial Working Acres	Re-erad. Acres	Total Acres	Un-worked Acres
Yosemite	146,300	77,400	20,866	56,534	26,111	34,600	30,918	3,682	330	34,300	34,300
Sequoia	99,900	21,100	8,685	12,415	4,457	50,600	50,600	-	-	28,200	28,200
Kings-Canyon	22,430	18,430	13,163	5,267	3,255	4,000	4,000	-	-	-	-
Lassen	17,565	11,196	-	11,196	1,979	6,369	-	6,369	1,076	-	-
Crater	3,782	3,782	150	3,632	350	-	-	-	-	-	-
Grand Totals	289,977	131,908	42,864	89,044	36,152	95,569	85,518	10,051	1,406	62,500	62,500

TABLE 4

SUMMARY OF CHECKING ON THE NATIONAL PARK SERVICE PROJECT - 1946

Operation	Regular Check			Advance Check			Post Check			All Checks		
	Acres Covered By Final Check	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days
Yosemite	6,038	4.8	158.9	-	-	-	4,894	3.7	128.1	10,932	4.4	287.0
Sequoia-Kings Canyon	3,043	4.6	47.8	896	4.4	7.7	3,034	4.4	84.9	6,973	4.5	140.4
Totals	9,081	4.7	206.7	896	4.4	7.7	7,928	4.0	212.9	17,905	4.4	427.3

TABLE 5
(Omnibus Table B - Sheet 2)

STATUS OF RIBES ERADICATION ON NATIONAL PARK LANDS, DECEMBER 31, 1946
PACIFIC COAST REGION

National Park Lands	Total Acres		First Working		Second Working	Other Workings	On Maintenance*		Remaining Work	
	White Pine	Control Area	Acres	Per Cent	Acres	Acres	Acres	Per Cent	Unworked Acres	Requiring Rework Acres
Lassen Volcanic	17,425	17,425	17,425	100	3,040					
Yosemite	143,790	143,790	60,446	42	19,102	4,078			83,344	
Kings Canyon	22,430	22,430	5,267	23	3,255				17,163	
Sequoia	99,900	99,900	12,415	12	2,187				87,485	
California Totals	283,545	283,545	95,553	34	27,584	4,078	30,360	11	187,992	65,193
Crater Lake	3,782	3,782	3,632	96	350		2,829	75	150	803
Totals	287,327	287,327	99,185	35	27,934	4,078	33,189	12	188,142	65,996

*These figures not changed from 1945 pending completion of study of problem of maintenance.

PART VI

BLISTER RUST CONTROL BY THE OREGON AND CALIFORNIA REVESTED LANDS ADMINISTRATION

Financial Project BLR-6

By

Homer R. Bryan, Agent, SP-7

PURPOSE

This project has been established to protect from white pine blister rust those white pine stands growing on lands managed by the Oregon and California Revested Lands Administration of the United States Department of the Interior. These lands are located in Oregon, and the project is confined to that state.

COOPERATION

The cooperative agreement between the Bureau and the Oregon and California Revested Lands Administration was necessary since the Bureau is responsible for the leadership in the general blister-rust-control program, for the development of technical phases and the dissemination of information on all control work regardless of ownership, and the coordination of the efforts of all agencies undertaking control work.

The memorandum of understanding between the Bureau and the O and C Administration, first made effective on June 21, 1945, was continued in force during 1946.

ORGANIZATION AND LOCATION OF CONTROL WORK

Technical supervision of the field work and checking were handled by the Bureau personnel under the direction of Mr. C. P. Wessela, operation supervisor, and Mr. Lyle Anderson and Mr. Homer Bryan, assistant operation supervisors. Checkers were selected, supervised, and paid by the Bureau. The O and C Revested Lands Administration is to reimburse the Bureau for the checkers' time spent checking O and C control units. Camp management and supply problems were supervised by Mr. Robert Warnock, blister-rust-control project superintendent in Medford for the O and C Administration. Policies and over-all planning of the field work for the O and C Administration were directed by Mr. Mark A. Pike, Forester, from the regional office in Portland, Oregon.

Recruitment was the responsibility of the O and C Administration; however, some assistance in obtaining labor was provided by the Bureau. Labor in all O and C camps consisted almost entirely of high school boys. There was insufficient labor and inadequate qualified supervision to meet requirements. Best results were obtained from boys with one or more season's eradication experience.

Three eradication camps and one reconnaissance camp were operated by the O and C Revested Lands Administration during the 1946 season. Two ribes eradication camps were located in the Swede Basin area in the Siskiyou National Forest; one at Spaulding Mill on Soldier Creek and one on Swede Creek. The other ribes eradication camp was located on Blue Jay Creek in the Pinehurst unit near the Rogue River National Forest.

A reconnaissance camp located on Quartz Creek in the East Galice area east of the Siskiyou National Forest boundary was operated for a short period after ribes eradication had ceased.

WORK PERFORMED AND RESULTS ACCOMPLISHED

One six-man crew under the direction of a camp foreman constructed all O and C Administration eradication camps. Some prefabricating had been done prior to the start of actual construction.

Eradication results are summarized in table 1.

The Swede Basin camp began eradication operations on June 10 with approximately 50 boys, and closed on August 23 when the boys returned to school. The area assigned to Swede Basin was completed and no camp is contemplated at this site next season. Two blister rust infection centers on sugar pine reproduction were discovered and removed. Both were close to the edge of the control boundary.

Spaulding Mill began eradication operations on June 18 with approximately 50 boys and closed on August 27. It did not complete treatment on the area assigned.

The Pinehurst eradication camp began eradication on July 3 with approximately 80 boys. Camp strength dwindled steadily until it was necessary to close the camp on September 3. All treatment was initial. Heavy concentrations of ribes in thick upland ground cover and very heavy concentrations of Ribes lacustre in dense willow thickets along streams made progress very slow. As a result, work was not completed in this control area. Although there appears to be little blister rust infection on sugar pine in the area, one pocket of approximately 20 acres of very heavy infection on sugar pine was found and light ribes infections are common throughout the Pinehurst area. A total of 2,827 sugar pine were inspected in this infection pocket. Of these, 1,963 trees were infected with 3,724 limb cankers and 587 trunk cankers. Only 727 cankers were removed by pruning.

Checking methods remained the same as those employed in previous years. Checking accomplishments for the 1946 season are shown in table 3.

A seven-man sugar pine reconnaissance crew was organized after the eradication season had closed. Men were selected who will probably return to the ribes eradication camps in supervisory capacities. Thus the reconnaissance camp served the dual purpose of training overhead and sampling sugar pine areas. The camp was established on Quartz Creek in the East Galice area east of the Siskiyou National Forest boundary on September 3 and closed on September 27. Approximately 6,000 acres of all ownership were covered in 116 man days using the 1946 Bureau method of sampling. The area covered this season is adjacent to and supplements areas covered

by the 1937 sugar pine reconnaissance. Although a small area in this East Galice unit is still in need of sugar pine reconnaissance, enough area has already been sampled and enough pine found to warrant consideration of the establishment of a blister-rust-control unit.

FUNDS EXPENDED

Regular funds expended by the Oregon and California Revested Lands Administration for the calendar year of 1946 were $109,914.

RECOMMENDATIONS FOR FUTURE WORK

The practice of treating areas calculated to give the greatest amount of protection to the area as a whole should be continued. Priority should be given to the best sugar pine sites under the administration of the Oregon and California Revested Lands Administration. A standard system of sugar pine reconnaissance should be established and continued to allow comparison between sites and thus facilitate establishing the order of eradication work.

It is recommended that both cankers and ribes be removed from infection centers in the control units as soon as discovered to retard the spread of the infection. This should also be done where practical in areas outside but closely adjacent to the control boundaries.

Reduction of camp construction costs, less confusion and wasted man days in starting camps, and a better satisfied camp personnel may be achieved by completing the construction of camps before eradicators arrive. Prefabrication of camp buildings during the winter months should further facilitate camp construction.

Camp supervisory personnel should have one or two days to acquaint themselves with their area before eradication begins.

Recruitment of eradicators should receive considerable attention. It is recommended that the ribes eradication program be expanded just so far as good quality laborers and capable camp supervision can be secured. Laborers should be above high school age unless they have previous eradication experience with good recommendations. Each man should be carefully rated during the 1947 season by his supervisor so that a backlog of dependable labor may be built up for succeeding seasons.

The possibilities of contracting ribes eradication should be investigated and interest stimulated among prospective contractors.

It is strongly recommended that a direct "chain of command" plan be instituted and that all O and C Administration blister-rust-control personnel in the Medford area receive all directions through and be directly responsible to the O and C project superintendent in Medford and that he be directly responsible to one man in the Portland office of the Oregon and California Revested Lands Administration.

TABLE 1

SUMMARY OF RIBES ERADICATION BY THE OREGON & CALIFORNIA REVESTED LANDS ADMINISTRATION IN 1946*

Control Operation	Acres Worked**	8-Hour Man Days	Total Ribes Eradicated	Per Acre Worked: 8-Hour Man Days	Per Acre Worked: Ribes	Ownership Status: Acres Covered: Federal: National Forest	Acres Covered: Federal: O & C	Acres Covered: Federal: Total	Acres Covered: Private	8-Hour Man Days: Federal: National Forest	8-Hour Man Days: Federal: O & C	8-Hour Man Days: Federal: Total	8-Hour Man Days: Private	Ribes Eradicated: Federal: National Forest	Ribes Eradicated: Federal: O & C	Ribes Eradicated: Federal: Total	Ribes Eradicated: Private	Acres Ribes-Free At Re-eradication
Initial Work																		
Rogue River N. F.	1,600	1,994	122,209	1.25	76		960	960	640		1,304	1,304	690		106,738	106,738	15,471	
Reeradication Work																		
Siskiyou N. F.	2,678	2,687	43,160	1.00	16	634	1,670	2,304	374	728	1,802	2,530	157	10,288	30,107	40,395	2,765	3,922
All Workings																		
Totals -	4,278	4,681	165,369	1.09	39	634	2,630	3,264	1,014	728	3,106	3,834	847	10,288	136,845	147,133	18,236	3,922

*Includes work done by the Oregon & California Revested Lands Administration on lands of all ownership.
**No acres were blocked-out in 1946.

TABLE 2

SUMMARY OF RIBES ERADICATION BY THE OREGON & CALIFORNIA REVESTED LANDS ADMINISTRATION 1940-1946*

Control Operation	Acres: Worked	Acres: Blocked Out	Acres: Total	8-Hour Man Days	Total Ribes Eradicated	Per Acre Worked: 8-Hour Man Days	Per Acre Worked: Ribes	Ownership Status: Acres Covered: Federal: National Forest	Acres Covered: Federal: O & C	Acres Covered: Federal: Total	Acres Covered: Private	8-Hour Man Days: Federal: National Forest	8-Hour Man Days: Federal: O & C	8-Hour Man Days: Federal: Total	8-Hour Man Days: Private	Ribes Eradicated: Federal: National Forest	Ribes Eradicated: Federal: O & C	Ribes Eradicated: Federal: Total	Ribes Eradicated: Private	Acres Ribes-Free At Re-eradication
Initial Work																				
Rogue River N. F.	4,449	1,095	5,544	4,276	297,868	0.96	67		2,344	2,344	3,200		2,357	2,357	1,919		185,350	185,350	116,518	
Siskiyou N. F.	7,792	14,724	22,516	7,735	519,003	0.99	67	9,671	11,463	21,134	1,382	3,120	4,304	7,424	311	207,701	297,528	505,229	13,774	
Siuslaw N. F. Nursery Sanitation	150		150	273	8,339	1.82	56		110	110	40		162	162	111		5,462	5,462	2,877	
Totals -	12,391	15,819	28,210	12,284	829,210	0.99	67	9,671	13,917	23,588	4,622	3,120	6,823	9,943	2,341	207,701	488,340	696,041	133,169	
Reeradication Work																				
Siskiyou N. F.	4,516		4,516	4,370	82,787	0.97	18	1,074	2,788	3,862	654	1,611	2,500	4,111	259	37,295	42,098	79,393	3,394	5,116
All Workings																				
Rogue River N. F.	4,449	1,095	5,544	4,276	297,868	0.96	67		2,344	2,344	3,200		2,357	2,357	1,919		185,350	185,350	116,518	
Siskiyou N. F.	12,308	14,724	27,032	12,105	601,790	0.98	49	10,745	14,251	24,996	2,036	4,731	6,804	11,535	570	244,996	339,626	584,622	17,168	5,116
Siuslaw N. F. Nursery Sanitation	150		150	273	8,339	1.82	56		110	110	40		162	162	111		5,462	5,462	2,877	
Totals -	16,907	15,819	32,726	16,654	911,997	0.99	54	10,745	16,705	27,450	5,276	4,731	9,323	14,054	2,600	244,996	530,438	775,434	136,563	5,116

*Includes work done by the Oregon & California Revested Lands Administration on lands of all ownership.

TABLE 3

SUMMARY OF CHECKING ON THE O & C PROJECT - 1946

Operation	Regular Check			Advance Check			Post Check			All Checks		
	Acres Covered By Final Check	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days	Acres Covered	Per Cent Of Check	Man Days
Rogue River	1,280	5.1	33.3	4,040	2.9	43.7	-	-	-	5,320	3.5	77.0
Siskiyou	4,604	5.6	103.2	-	-	-	5,969	5.2	103.8	10,573	5.4	207.0
Totals	5,884	5.5	136.5	4,040	2.9	43.7	5,969	5.2	103.8	15,893	4.7	284.0

TABLE 4

ACREAGE OF O & C LANDS WORKED BY ALL AGENCIES IN 1946
PACIFIC COAST REGION

Control Operation	First Working Acres	Second Working Acres	Other Workings Acres	All Workings Acres
Rogue River	960	-	-	960
Siskiyou	-	1,822	688	2,510
Klamath	279	139	-	418
Totals	1,239	1,961	688	3,888

TABLE 5

ACREAGE OF O & C LANDS WORKED BY ALL AGENCIES AS OF DECEMBER 31, 1946
PACIFIC COAST REGION

Control Operation	First Working Acres	Second Working Acres	Other Workings Acres	Total Workings Acres
Rogue River	7,738	-	-	7,738
Siskiyou	33,120	2,940	688	36,748
Klamath	930	139	-	1,069
McKinley Nursery (Siuslaw N.F.)	110	-	-	110
Totals	41,898	3,079	688	45,665

PART VII

SCOUTING AND DISEASE SURVEY

By

Douglas R. Miller, Pathologist, P-3

The work of the Scouting and Disease Survey Project was continued during the 1946 season. The program included some disease survey work as well as scouting for white pine blister rust, Cronartium ribicola, in the Pacific Coast Region. The aim of the scouting program was the same as that of preceding years, namely: first, to ascertain whether or not a long-distance spread of the rust had occurred from aeciospores produced in the north; secondly, to determine the amount of intensification of the disease on pine at those areas previously infected; thirdly, to retard the development of the rust as much as possible by eliminating all cankers located; and fourthly, to collect information on those sites harboring conditions highly favorable to the incidence and development of the rust so that the urgency of each area's need of ribes eradication can be determined. The aim of the disease survey was to determine the extent and intensity of blister rust infection on pine and to determine the effectiveness of control work.

SECTION I - SCOUTING FOR THE RUST

The status of the known spread of blister rust at the beginning of the 1946 scouting season and a short history of its spread in the Pacific Coast Region follows:

Oregon

Blister rust was discovered in northwestern Oregon during the summer of 1925. Since then, it has spread southward throughout the western white and sugar pine stands of both the Coast and Cascade Ranges. In southern Oregon at locations favorable to rust development, it is not uncommon to find the disease generally present on five-needled pines.

California

Blister rust on both ribes and pines was discovered in California during 1936. At that time, the disease was confined to a narrow belt lying just south of the Oregon line on the Klamath National Forest. Weather conditions during the spring of 1937 and 1938 were favorable to aeciospore dissemination as well as to ribes infection, and the rust made a long-distance spread into both the Coast Range and Sierra Nevada Mountains. By the end of the 1944 season, many blister rust cankers on sugar pine had been found on the southern end of the Plumas National Forest, a distance of about 165 miles south of the Oregon line. Infected ribes had been found along the coast at a point 265 miles south of the Oregon line as well as on the southern Eldorado National Forest, which is about 240 miles south of the boundary. Weather conditions were not conducive to the spread and development of the disease in 1945.

Table 1 presents by years the known southward spread of the rust measured in miles from the Oregon line and gives the generic host involved for each of the two sugar pine areas in California.

TABLE 1

ANNUAL SPREAD SOUTHWARD OF BLISTER RUST IN CALIFORNIA

Area	Infected Host	Spread in Miles from Oregon Border										
		1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946
Sierra Nevada	Sugar Pine					107	165	165	165	165	165	204
	Ribes		120	160	160	160	160	160	175	240	240	240
Coast Range	Sugar Pine	4	4	4	14	42	42	42	115	115	115	121
	Ribes	6	125	125	125	125	200	210	265	265	265	265

ORGANIZATION AND METHODS OF WORK

The scouting force, during the active ribes eradication season, consisted of two disease survey crews one working on the Klamath National Forest and the other on the Rogue River National Forest. Although the crews were primarily interested in other work all the data collected were incorporated into the scouting report. In early September, members of the Bureau's staff as well as several seasonal employees were organized into scouting parties. These crews varied in size from two to six men, and the last crew discontinued work October 15. In addition, members of the Division of Forest Pathology and of the blister rust personnel of all agencies on the various operations both in Oregon and California made observations while performing their regular duties.

The methods used in scouting and the mechanics of performing the work as well as recording the data were the same as those described in the 1942 annual report. Scouts from the Stanislaus, Eldorado, Plumas, and Lassen National Forests assembled at the Hatchet Mountain blister rust camp where a training school was held. The men were shown blister rust cankers and rusted ribes and were then instructed in their duties of scouting for the disease on both pine trees and ribes bushes. Locating areas which support conditions favorable to the establishment and development of the rust was again strongly emphasized. The practice of pruning most of the pines examined and of removing all cankers found was continued.

WORK PERFORMED AND RESULTS OBTAINED

The ninth annual survey of the charts of upper air currents and other meteorological records covering the Pacific Coast for the spring months of 1946 was made by Dr. W. W. Wagener of the Division of Forest Pathology. In a letter to W. V. Benedict, dated August 28, 1946, he states in part:

> "With the known increase in pine infection in southern Oregon and on parts of the Klamath National Forest, it has seemed somewhat questionable whether a survey of the upper air currents for the Pacific Coast on the basis heretofore used would be of any particular value in judging the chances for a further extension of blister rust for this year in California. However, ... an examination has just been completed....

"This year more attention was paid to winds that appeared to be favorable for the movement of spores from southern Oregon and the Siskiyous into the southern Sierras. Records prior to April 20 were not consulted as observations in the field had indicated that there had been little sporulation from pine cankers prior to that time.

"Fair wind conditions for the movement of spores southward through the State were found to have occurred on May 5-6, May 8-9, May 18, and May 27-29. The latter two days of the last period would have had no effect, even if highly favorable, as no rain was recorded in the Sierras south of Mt. Lassen from May 27 until the end of June and if spores had been transported there would have been no chances for their germination except from dews on low ground. Precipitation during May was confined almost entirely to the 21-23 and 25-27 except for the extremely northern end of the State and for scattered light rains in the southern Sierras on May 10-11.

"Since none of the periods in May prior to the general rains beginning on the 21st were particularly favorable nor persistent it appears that the prospects for the spread of spores into the Southern Sierras this year were not very good unless the spores originated from some source closer than the Klamath National Forest."

Intensive scouting in the Sierras revealed that no long-distance spread of the rust occurred in 1946. Nearly all of the diseased ribes located were within a short distance of sporulating cankers and no infected bush was found growing at a distance greater than a few miles from aecia-bearing cankers. Scouting also showed that the intensification of the rust on ribes leaves was again exceedingly light when compared with that of 1944. In nearly every case the disease occurring on ribes growing 20 or more chains from the source of aeciospores was confined to from one to six leaves. This light intensity of the rust on ribes was general even on the Klamath National Forest where the disease has been making almost unprecedented intensification each year. It was not uncommon to find rust-free bushes of the highly susceptible species *Ribes sanguineum* growing beneath sporulating cankers.

The lack of a general spread of the rust during the spring is attributed to the lack of rain during the time of aeciospore maturity and dissemination. Northern California and southern Oregon, the greatest source of aeciospore production, had an early spring and very little if any rain fell from April 1 to the latter part of May. The dry period extended well into June for those areas located along the north end of the Sierra Mountains. Numerous samples of a species of *Cronartium* on ribes leaves were sent in from the Trinity, Shasta, Lassen, Plumas, Eldorado, Stanislaus, Sierra, and Sequoia National Forests as well as from the Yosemite, Kings Canyon and Sequoia National Parks. All specimens from the first three forests were identified as blister rust and probably resulted from local cankers. There was one specimen of pinyon rust sent in from the Plumas, but all other samples from this forest were determined to be blister rust. Every rust sample from the Tahoe National Forest southward was identified as pinyon rust. The determination of *Cronartium* samples collected from the Eldorado National Forest southward were not

always positive. It appears that pinyon rust samples, which have had part of the telia germinated, occasionally give weak to medium blister rust reactions. Macroscopic examinations made before the stain tests were applied, placed all of the doubtful specimens in the pinyon group.

The rust in southern Oregon is gradually infecting the western white and sugar pine growing between the original infection pockets. This is especially true where bushes of Ribes sanguineum are present. Nearly all of the pine damage in southern Oregon and northern California can be traced to this species. It is few infection centers indeed that have been found which were caused by other ribes species (other than R. bracteosum which occurs only to a limited extent along a few of the streams in this country). The reasons that bushes of R. sanguineum are so much more dangerous than other native ribes species are:

1. It is one of the two most susceptible ribes species if not the most susceptible in the Sugar Pine Region. Several instances have been noted where rusted bushes of R. sanguineum were found growing beside rust-free bushes of R. bracteosum, the other highly susceptible species.

2. The rust intensifies to a greater extent on leaves of R. sanguineum than it does on the leaves of any other species in the Sugar Pine Region. With an occasional shower the rust will intensify throughout the summer on the leaves of this species. In late fall it is not uncommon to find leaves of R. sanguineum completely covered with telia yet this condition has never been observed for any other species.

3. Leaves of R. sanguineum remain on the bush as late if not later in the fall than do the leaves of any other species of ribes found in the Sugar Pine Region. During late scouting in 1946 the leaves were either gone or nearly gone from bushes growing either in the open or partial shade for R. roezli, R. cereum, R. inerme, R. viscosissimum, R. amarum, R. binominatum, R. bracteosum, R. cruentum, R. klamathense, R. lacustre, R. lobbi, R. marshalli, and R. montigenum, while leaves of R. sanguineum and R. nevadense remained on the bushes even after several frosts.

4. The leaves of some ribes species drop prematurely when the rust makes a heavy intensification upon them. This is particularly true of R. roezli and R. cruentum and to a lesser extent of other species that intensify the rust to any degree. This may be true to some extent for R. sanguineum but hundreds of bushes have been observed with the underside of all leaves practically covered with telia yet these leaves were still clinging to the stems.

A good example depicting the effectiveness of control is found in Section 18, T. 32 S., R. 3 E., on the Rogue River National Forest of Oregon. The rust first became established in 1937 and the first control work was performed in 1938. The section has 692 acres and the portion south of Graham Creek comprising 121 acres was not worked. The final check (following ribes eradication) in 1938 showed several small ribes inside the control unit particularly on north-facing slopes near the streams.

During 1946 a disease survey was made of the sugar pine growing in this section and the results were very encouraging from the control standpoint. By using a ten-chain zone as a protective strip north of Graham Creek, it

was found that 133 of the total 160 infected pines for the section were either in the protective zone or in the unworked portion of the section. Of the 602 cankers found on the sample strips, 516 were on the 133 pines. An analysis shows that 44 of the 86 cankers located inside the protected area were old enough to kill the branch or tip of the branch on which they were growing. The exact age could not be determined on these but it appears that most or all of them originated in 1937. Of the 42 remaining cankers found inside the protected area, 12 were on 1941 wood, 10 on 1942 wood, 1 on 1943 wood, and the remaining 18 were on wood grown previous to 1941. All but one of the 86 cankers inside the unit were at three infection centers situated beside small streams.

The final check made in 1938 shows that from a few to several small ribes bushes were left at the spots where the cankers were found in 1946. The advance check in 1938 showed that numerous large bushes were growing on these same areas before ribes eradication work was performed. The disease made its entrance and became established on sugar pine during the 1937 season and has made only a small amount of intensification on the pines since that time.

A further analysis of checking data of one of the small infection centers beside Deep Creek in the northwest corner of the section reveals that the area had 64 ribes and 828 feet of live stem per acre before it was worked in 1938. This amount was reduced to 4.5 ribes and 17.5 feet of live stem during the initial treatment. A post check in 1943 showed an increase to 11.5 bushes and 113 feet of live stem per acre.

A study of the disease survey data for this same area reveals that there were 64 young sugar pine trees per acre, 9 of which were infected with 45 cankers. Seven of the 9 trees supported cankers that had already "flagged" indicating that they had originated during the rust wave of 1937. Only two additional trees had been infected since the area had been treated. Of the original 7 diseased trees only 3 were reinfected during the years following blister-rust-control work. The 9 infected trees had 45 cankers when examined in 1946. Of these 45 cankers 19 had "flagged" before 1946 indicating that this number originated in 1937, hence 26 cankers have originated on 5 trees since the initial infection. Considering the number of bushes and feet of live stem involved, this is not an excessive nor even a dangerous amount of rust. The Deep Creek infection center was by far the heaviest pine infection area occurring within the portion of this section located inside the control unit. When this increase of cankers is compared to the buildup of rust outside the unit, it readily becomes apparent that ribes eradication has been effective in the control of white pine blister rust within the treated portion of the unit.

It appears that the susceptibility of the various species of ribes to blister rust and their ability to intensify the rust during the season varies somewhat from year to year. The 1946 season was generally unfavorable to ribes infection, however, there were more bushes of Ribes lobbi infected during that season than had ever been observed before. The amounts of infection of R. lobbi for the years of 1942 through 1946 are shown in the following table.

TABLE 2

AMOUNT OF INFECTION OF RIBES LOBBI FOR YEARS 1942-1946

1942			1943			1944			1945			1946		
Ex.	Inf.	% Inf.	Ex.	Inf.	% Inf.	Ex.	Inf.	% Inf.	Ex.	Inf.	% Inf.	Ex.	Inf.	% Inf.
2103	23	1.1	3192	106	3.3	1750	134	7.7	512	11	2.1	1242	144	11.6

Ex. = Examined; Inf. = Infected

The data for table 2 were collected on scouting in the southern Oregon forests and on the Klamath National Forest of California.

A sugar pine infection center was located near the Swede Basin blister-rust-control camp in 1946 that appeared to have resulted from bushes of R. lobbi. When the timber was being removed, a spur road ending in a turnaround was built. As a result of this soil disturbance, a heavy regeneration of R. lobbi occurred. There were numerous young sugar pine trees growing on this area. The rust made its entrance in 1941 and infected pines were limited to an area of about two acres surrounding the clearing containing the ribes. A count revealed 90 sugar pine to be infected with 227 cankers.

Since the infected pines were concentrated around the patch of ribes, and since the nearest bush of R. sanguineum was from 8 to 10 chains from the center, there was little doubt that R. lobbi became infected in 1941 and returned the rust to the pines that fall. This is one of the few infection centers in the Sugar Pine Region that has been caused by a ribes species other than R. sanguineum and R. bracteosum.

Another infection center of interest was found near Yew Spring in the Pinehurst area on the southern end of the Rogue River National Forest. This is the first time a sizable blister rust infection center has been found on the east side of the Green Springs Summit. It was located in and around a small swampy meadow in the north end of section 17, T. 39 S., R. 4 E. This site was ideal for the rust to make its incidence and subsequent rapid development as the meadow afforded an excellent opening in the timber canopy. In addition there were hundreds of small sugar pines in the vicinity, and while growing in and around the meadow were numerous bushes of R. sanguineum associated with bushes of five other ribes species.

The sugar pine trees in the Pinehurst area are generally slow growing; and, as a result, the cankers were mostly poorly developed with many of them already dead. The rust had made its entry in 1937 and since that time 1,963 trees have become infected with 4,311 cankers. Bushes of R. sanguineum being scattered throughout the heavy young stand of sugar pine growing around the meadow probably accounts for the large number of infected trees. The ribes were removed from this part of the control unit during 1946 and all cankers found were destroyed.

During the heavy spread of blister rust from pine to ribes which occurred in 1944, infected ribes were found as far southward as the Eldorado National Forest. In 1946 infected sugar pines were found in both Lower and Middle

Meadows in the Long Canyon drainage basin on the northern end of that forest. There were four infected trees found at Lower Meadow and these had ten cankers. At Middle Meadow five infected sugar pine trees had seven cankers. All cankers found were removed and the ribes should be destroyed in 1947. The finding of these cankers extended the known pine infection zone about 30 miles farther south in the sugar pine belt. This further illustrates that blister rust in California continues its southward spread at irregular intervals.

The pine infection centers on the Tahoe National Forest were situated at and below Boyington in the Pipe Creek drainage basin and at the Rosewood Mine in Collins Ravine. These centers are at the extreme north end of the forest where rusted ribes were found in 1944. There were 13 infected pines at the Boyington center with 24 cankers and one infected tree with one canker at the Rosewood Mine.

Although numerous areas harboring conditions favorable to rust development were examined on both the Eldorado and Tahoe National Forest, no other pine infection centers were found. These centers, comparatively light in rust intensity, are exceedingly few in number to be the resultant of the large amount of ribes infection found on the forests in 1944. This indicates that climatic conditions may not be favorable to the development of the rust in the northern Sierras. This hypothesis is further borne out by the fact that the rust has been on the Plumas National Forest (just north of the Tahoe) since 1938 and during the 1946 season 1,643 sugar pine trees, growing at the most favorable sites for rust incidence and development, were examined. Of this number 5 were found to be infected with 6 cankers. This means that the rust is not making much development; however, all cankers have been destroyed when found.

The lack of rust development is further indicated on the Lassen National Forest. Of 2,766 trees examined, 79 were found to be infected with 198 cankers. The rust had been present there since 1937, the same year that the general spread occurred in both the extreme northern end of the state and in southern Oregon. Yet, in the latter areas, the rust is present in practically every favorable site that has not been protected and is now beginning to fill in between the best rust locations, while on the Lassen National Forest cankers are difficult to find even at the original infection centers. The ribes at some of the initial infection centers have not been removed although the cankers have been destroyed when found. Even under these conditions, it is difficult to find many infected trees or cankers although the rust became established nine years ago.

There was one pine infection center on the east side of the Shasta National Forest that is of considerable interest. The area lies along the headwaters of Indian Creek in section 3, T. 37 N., R. 1 E. There were numerous young sugar pine trees growing along each side of the stream and a medium dense concentration of ribes bushes was growing beneath the timber. The ribes population was composed of bushes of *Ribes nevadense*, *R. cruentum*, and *R. roezli*. The rust made its entrance either in 1937 or 1938 as several trees bearing cankers of that age were found. Another wave of cankers appeared in 1941 and still another wave in 1944. Although lack of time prevented a thorough coverage of this area, most of the infected pines were removed in 1946. From the number removed, it is estimated there will be about 900 cankerous trees with 2,000 cankers.

The Indian Creek infection center is by far the heaviest yet found in the Sierra belt of sugar pine. This center, of about 25 acres, extended along the creek for 25 to 30 chains and in no place did it exceed ten chains in width. Scouting in this general district at several other sites harboring conditions favorable to rust development revealed only two more infected trees with three cankers. This indicates that although one heavy infection center was located, the rust is not developing at an alarming rate. This lack of general intensification substantiates the observation first made in 1941 that conditions necessary to the incidence and development of the rust are much less uniform in the northern sugar pine belt of the Sierras than is the case for white pine stands farther north. Since that time, this condition has been observed so frequently that the principle has become incorporated in the ribes eradication policies and forms the basis for the selected-area or spot-working type of treatment.

It appears that this lack of uniformity of conditions necessary for rust development becomes more and more intensified with southward progress; hence, only a few small areas on the Tahoe and Eldorado National Forests and perhaps none on the Stanislaus National Forest harbored conditions favorable to pine infection during the fall of 1944. If this is the case, spot-working should assume even greater importance in the southern portion of the Sierra belt of sugar pine.

The rust is beginning to make its appearance on pine at several places on the Trinity National Forest. There is, generally, poor association between host plants on this forest; but wherever numerous bushes of Ribes sanguineum occurs within sugar pine stands, cankers can be found. Pine infection centers were found for the first time in Indian Valley and on South Fork Mountain. The rust in Indian Valley resulted from patches of dense concentrations of R. cruentum growing along the stream bottoms; but since very few sugar pines grow near the streams, only a few trees were involved. For areas having had the rust present for nine years there were few diseased trees present, and the intensification of the rust on sugar pine was exceedingly light as compared to similar areas farther north.

South Fork Mountain supports a fair stand of sugar pine on its north slope but bushes of R. sanguineum occur within these stands. Many of the streams on this side of the mountain support bushes of R. bracteosum along their banks. This is the only part of the forest where a rapid development of the rust on pine seems likely to occur.

A few additional bushes of R. cereum were found to be infected in 1946. On the Rogue River National Forest, section 20, T. 32 S., R. 3 E., there were 227 bushes of this species examined, of which seven were found to be infected. An examination of the rusted bushes showed that the rust was confined to from one to three leaves with no one leaf having more than one small diseased spot. There were several sporulating cankers in the vicinity of the rusted bushes.

An examination was made of the infection center beside the road near Watson Creek on the Umpqua National Forest. Of the 29 R. cereum bushes found growing in this area, nine were lightly infected. Again the limit of infection found on any one bush was three leaves; however, two leaves among the rusted ones had about one-half of their undersurface and part of their petioles covered with telia.

As only 31 rusted bushes of Ribes cereum growing under natural conditions have been found in the Region to date, this species is proving to be practically resistant to white pine blister rust infection. This is the reason that its eradication is being deferred wherever it occurs in numbers within the northern control unit boundaries. Accumulated data indicate that bushes of R. lacustre may be handled in the same manner, and, if data secured during the next season or two continue to show the same results, this recommendation will be made.

Scouting on both sugar and western white pine revealed few cankers of 1944 origin. Of 6,086 cankers found by the disease survey crews, only 15 were on 1944 wood, 117 on 1943 wood and 403 on 1942 wood. Needles of these three years' growth should have been responsible for most of the cankers resulting from the 1944 wave of rust. From the degree of development of the cankers found on 1942 and 1943 wood, it was obvious that only about one-half of them originated in 1944. The scouting crews reported few cankers of 1944 origin even at the heavy rust centers on the lower Klamath National Forest. These results further substantiate the observations made in 1945 that conditions necessary for the return of the rust from ribes leaves to pine needles were none too favorable during the fall of 1944.

A summarization by forests and parks of the number of each host found to be infected is presented in table 3. The examination of ribes bushes for blister rust constituted most of the work performed by the scouts. Numerous pines, however, were examined in the outer zones of infection; but there were not enough man days available to concentrate on the removal of cankers at the heavy pine infection centers in southern Oregon and northern California. Of the 66,875 white pines examined 6,735 were infected with 33,833 cankers.

At first glance it seems that the pine is pretty heavily infected as 10.1 per cent of all the trees examined were diseased. It must be remembered that nearly all of the scouting took place at those sites most favorable to rust development which embraced most of the heaviest infection centers in the Region. In addition, many of the areas examined during the course of scouting occurred outside control unit boundaries where little if any effort is being made to keep the rust under control. A disease survey made on over 16,000 acres of the heaviest pine infection areas within control unit boundaries showed only 3.8 per cent of the trees infected.

SUMMARY

A resume of the scouting season follows:

1. There was no general long-distance spread of the rust in California from aeciospores produced at northern sources.

2. A lack of precipitation during aeciospore maturity and dissemination probably was the greatest factor in preventing a long-distance spread as there were some favorable winds during that period. Climatic conditions during the summer were generally unfavorable for intensifying the rust on the leaves of ribes bushes.

3. There was very little pinyon rust found north of the Eldorado National Forest, but from the southern end of this forest southward there was a fairly heavy spread to the ribes.

4. The intensification of the rust on pine in the Sierra infection centers as compared to centers farther north has been extremely light at all but the Indian Creek area on the Shasta National Forest. This indicates that pine damage from white pine blister rust will be much slower in the Sierra sugar pine belt than has been the case on the Klamath National Forest.

5. Nearly all of the pine damage in southern Oregon and northern California is being caused by Ribes sanguineum.

6. Although rust intensification on ribes leaves during 1944 was the heaviest ever noted, comparatively few cankers of that year's origin have been found. This indicates that weather conditions during the fall of 1944 were highly unfavorable to pine infection.

7. The cankers found on sugar pine at Lower Meadows on the Eldorado National Forest extend the known pine infection about 40 miles deeper into the sugar pine belt.

8. It appears that the susceptibility of the various species of ribes to blister rust and their ability to intensify the rust during the season varies somewhat from year to year. This is illustrated by the unusual number of infected R. lobbi bushes found during 1946.

9. All found blister rust cankers other than those at the heavy pine centers on the Klamath National Forest were removed upon discovery, and many at the former locations were also eliminated. During the summer 33,833 cankers were removed from 6,735 diseased pines.

TABLE 3

SCOUTING RESULTS FOR THE PACIFIC COAST REGION - 1946

National Forest or Area	Ribes				White Pines				
		*Infected With					Cankers		
	Examined	BR	PR	Total	Examined	Infected	Stem	Limb	Total
Oregon									
Umpqua	175	57		57	175	68	49	802	851
Crater Lake National Park	711	16		16	280	3		3	3
Rogue River	2,277	396		396	37,676	3,105	923	5,623	6,546
Fremont	40								
Siskiyou	190	11		11	360	137	122	1,104	1,226
Klamath	633	130		130	7,324	310	134	3,559	3,693
Total for Oregon	4,026	610		610	45,815	3,623	1,228	11,091	12,319
California									
Klamath	1,047	356		356	11,474	2,075	799	18,294	19,093
Trinity	1,108	22		22	191	20	7	133	140
Mendocino	897				84				
Shasta	1,870	100		100	1,844	910	302	1,733	2,035
Modoc	1,149				141				
Lassen	6,099	427		427	2,766	79	20	178	198
Plumas	1,717	19	1	20	1,643	5	1	5	6
Tahoe	1,849		8	8	841	14	7	18	25
Eldorado	3,635		118	118	712	9	1	16	17
Stanislaus	5,702		323	323	1,151				
Yosemite	388		25	25	57				
Sierra	1,569		110	110	156				
Kings Canyon National Park	337		3	3					
Sequoia National Park	79		3	3					
Sequoia	158		6	6					
Total for California	27,604	924	597	1,521	21,060	3,112	1,137	20,377	21,514
Total Pacific Coast Region	31,630	1,534	597	2,131	66,875	6,735	2,365	31,468	33,833

*BR = Blister Rust
PR = Pinyon Rust

SECTION II - PINE DISEASE SURVEYS

An intensive disease survey on the heaviest rusted areas within control unit boundaries on both the Rogue River and Klamath National Forests was made to determine the extent and intensification of the rust on five-needled pines and to determine the effectiveness of control work.

ORGANIZATION AND METHODS OF WORK

Two of the reconnaissance crews were shifted to disease survey work during the last week of July and the first week of August. Each crew consisted of a chief of party and six men. The crews stayed in the ribes eradication camps hence no cook was needed. A five-day training school was held so that each man would not only know his duties but would also know how to perform them in the best manner.

Since this was the first disease-survey work done in the Region, some of the procedures were untried when the season started; however, after a couple of weeks most of the kinks had been ironed out and the methods used during the latter part of the season gave satisfactory results.

The section was used as the basic land unit. Eight parallel strips one-fourth chain wide were run at regular intervals in a cardinal direction. Distances were measured by pacing and courses were followed by use of a box compass. A two-man party was used; one man ran compass, paced, searched for ribes bushes, and recorded all data; while, the other examined all pines under 30 feet in height for cankers and called out information when a diseased tree was located.

The data were recorded by five-chain transects. The number of ribes and feet of live stem were recorded by species and a notation made when a bush was found to be infected. The number of pines examined, infected trees located, and cankers found were recorded. Cankers were listed by the year-of-growth of wood infected. Emphasis was placed upon an accurate tree count and examination. To aid in this the compass man dragged a heavy-weight piece of cord so that the tree inspector would have a definite center line from which to measure the boundaries of his strip. Nearly all of the white pines growing on the strip were pruned to aid in locating the cankers.

WORK PERFORMED AND RESULTS OBTAINED

One crew started disease survey work on the Klamath National Forest of California on July 25 and continued work until September 12. During this period 6,927 acres were sampled by covering all or parts of 12 sections. On the 83 miles of strip or 166 acres of sample, 15,496 sugar pine trees were examined and 806 of these were found to be infected with a total of 3,945 cankers. Of the trees examined on this forest 5.2 per cent were found to be infected with one or more cankers. There was an average of 4.9 cankers per infected tree.

Disease survey work was started on the Rogue River National Forest during the first week of August by a second crew, which continued the work into the first week of October. This crew sampled 9,376 acres by covering all or parts of 16 sections. There were 231 acres covered on the 115.5 miles

of strip run, and of the 34,135 trees occurring on the strips 1,104 supported 2,141 cankers. The rust was much lighter in intensity on sugar pine on the Rogue River Forest than on the Klamath National Forest. Actually it is somewhat lighter on the Rogue River than is shown by the preceding figures, as section 18, T. 32 S., R. 3 E., contained an area of 121 acres which lies outside control unit boundaries and it just so happens that this section had 160 infected trees with 602 cankers. Nearly all of this infection occurred either in the unworked portion of the section or in that portion of the control unit adjacent to the unworked area. Even as the data now stand only 3.2 per cent of the trees examined are infected, and these supported an average of only 1.9 cankers per tree. Had the data from section 18 been omitted the rust picture on this forest would look even brighter.

Table 1 presents the data in tabular form. A total of 16,303 acres were sampled, 49,631 trees examined of which 1,910 were infected with 6,086 cankers. There were 1,469 ribes examined with a total of 26,795 feet of live stem. Of this number of bushes 327 were infected.

TABLE 1

DISEASE SURVEY DATA - SUMMARY - 1946

Forest	Sampled	Pine Data			Ribes Data		
		Trees Examined	Trees Infected	Total Cankers	Bushes Examined	Bushes Infected	Total FLS
Klamath	6,927	15,496	806	3,945	646	137	15,296
Rogue River	9,376	34,135	1,104	2,141	823	193	11,499
Total	16,303	49,631	1,910	6,086	1,469	330	26,795

Table 2 presents the data given in table 1 but puts them on an acreage basis. A total of 3.8 per cent of all the sugar pines examined were infected.

TABLE 2

DISEASE SURVEY DATA ON ACREAGE BASIS - 1946

Forest	Strip Acres	Pine Data Per Acre Basis				Ribes Data Per Acre Basis			Average Feet of LS Per Canker
		Trees Exam.	Trees Inf.	% of Trees Inf.	Total Cankers	Bushes Exam.	Bushes Inf.	Total FLS	
Klamath	166	93.4	4.9	5.2	23.8	3.9	0.8	92.1	3.9
Rogue River	231	147.8	4.7	3.2	9.3	3.6	0.9	49.8	5.4
Total	397	125.0	4.8	3.8	15.3	3.7	0.8	67.5	4.4

Table 3 shows the number of bushes and feet of live stem by species that were found on the strips. Bushes of Ribes sanguineum were more prevalent than those of any other species which may account for these areas having more pine infection than the adjoining territory.

Table 4 gives the number of bushes examined by species as well as the number infected and the per cent of infection. Of the seven species of ribes found R. sanguineum had an infection percentage almost double that of R. cruentum, the next heaviest infected species. About 44 per cent of the bushes of R. sanguineum were found to be rusted.

Table 5 compares the percentages of the bushes examined in each species to the total number examined and the number infected for each species to the total number examined.

Table 6 shows the percentages of infected bushes for each species in relation to the total number infected. The basic figures used for the percentages appearing in both tables 5 and 6 were taken from table 4.

A comparison of the results in tables 5 and 6 shows that 38.8 per cent of all bushes found were R. sanguineum, but of all the infected bushes found 76.4 per cent belonged to this species. Ribes lacustre had one-quarter of all the bushes examined but had only 2.4 per cent of the total rusted bushes. Bushes of R. lobbi were third in number examined with 22.0 per cent while only 11.2 per cent of the infected bushes occurred within this species. Of the total ribes examined 6.9 per cent were R. cruentum and this species had 7.9 per cent of the rust which was next to R. sanguineum in the ratio of bushes infected.

Table 7 shows the needle-retention pattern for sugar pine. The largest number of trees retained their needles for five years with four-year retention coming second and six-year third. Three trees dropped their needles after the second year, and one tree was found to retain its needles. Data were taken on the infected trees only.

A complete analysis is being made of all data that were collected by the disease survey crews and the results will be presented in a special paper. Recommendations for next season's work will be withheld until after the final results are available.

TABLE 3

NUMBER OF RIBES AND FEET OF LIVE STEM FOUND BY SPECIES BY FOREST - 1946

Forest	Ribes by Species															
	lobbi		cruentum		sang.		lacustre		cereum		visco.		klam.		Total	
	No.	FLS	No.	FLS	No.	FLS	No.	FLS	No.	FLS	No.	FLS	No.	FLS	No.	FLS
Klamath	133	1,432	84	1,986	157	7,154	256	4,580			15	143	1	1	646	15,296
Rogue River	191	2,521	17	223	413	2,628	124	2,666	40	3,138	7	31	31	292	823	11,499
Total	324	3,953	101	2,209	570	9,782	380	7,246	40	3,138	22	174	32	293	1,469	26,795

TABLE 4

NUMBER OF RIBES EXAMINED, NUMBER INFECTED, AND PER CENT INFECTED BY SPECIES BY FOREST - 1946

Forest	Ribes by Species																				
	lobbi			cruentum			sanguineum			lacustre			cereum*	viscosissimum			klamathense			Total		
	Ex.	Inf.	% Inf.	Ex.	Inf.	% Inf.	Ex.	Inf.	% Inf.	Ex.	Inf.	% Inf.	Ex.	Ex.	Inf.	% Inf.	Ex.	Inf.	% Inf.	Ex.	Inf.	% Inf.
Klamath	133	23	17.3	84	25	29.8	157	79	50.3	256	8	3.2		15	2	13.3	1			646	137	21.2
Rogue River	191	14	7.3	17	1	5.9	413	173	41.9	124			40	7			31	5	16.1	823	193	23.5
Total	324	37	11.4	101	26	25.7	570	252	44.2	380	8	2.1	40	22	2	9.1	32	5	15.6	1,469	330	22.5

*No infection found on this species.

TABLE 5

PER CENT OF TOTAL RIBES EXAMINED AND PER CENT OF TOTAL RIBES EXAMINED THAT WERE INFECTED BY SPECIES BY FOREST - 1946

Forest	Percentages by Ribes Species															
	lobbi		cruentum		sanguineum		lacustre		cereum		viscosissimum		klamathense		Total	
	Bu.	Inf.	Bu.	Inf.	Bu.	Inf.	Bu.	Inf.	Bu.	Inf.	Bu.	Inf.	Bu.	Inf.	Bu.	Inf.
Klamath	20.6	3.6	13.0	3.9	24.3	12.2	39.6	1.2			2.3	0.3	0.2		100.0	21.2
Rogue River	23.2	1.7	2.1	0.1	50.2	21.0	15.0		4.9		0.9		3.8	0.6	100.0	23.5
Total	22.0	2.5	6.9	1.8	38.8	17.2	25.9	0.5	2.7	0.0	1.5	0.1	2.2	0.3	100.0	22.5

TABLE 6

PER CENT OF TOTAL INFECTED RIBES BY SPECIES BY FOREST - 1946

Forest	Percentages by Ribes Species							
	lobbi	cruentum	sanguineum	lacustre	cereum	viscosissimum	klamathense	Total
Klamath	16.8	18.2	57.7	5.8	0.0	1.5	0.0	100.0
Rogue River	7.3	0.5	89.6	0.0	0.0	0.0	2.6	100.0
Total	11.2	7.9	76.4	2.4	0.0	0.6	1.5	100.0

TABLE 7

NEEDLE RETENTION PATTERN
SUGAR PINE

Number of Years of Needle Retention	Number and Per Cent of Trees by Forest					
	Rogue River National Forest		Klamath National Forest		Total	
	Number	Per Cent	Number	Per Cent	Number	Per Cent
2	3	.27	1	.12	4	.21
3	49	4.44	24	2.98	73	3.82
4	343	31.08	229	28.41	572	29.95
5	473	42.84	363	45.04	836	43.77
6	195	17.66	166	20.60	361	18.90
7	34	3.08	21	2.61	55	2.88
8	6	.54	1	.12	7	.37
9	1	.09	1	.12	2	.10
Total	1,104	100.00	806	100.00	1,910	100.00

PART VIII

BLISTER RUST CONTROL RECONNAISSANCE

By

Douglas R. Miller, Pathologist, P-3

INTRODUCTION

The need for a better means of segregating forest lands according to their capacity to produce sugar pine has become increasingly apparent with the progress of the blister-rust-control program. A workable method has been devised for the classification of sugar pine producing lands, into broad categories according to their expected yield of merchantable sugar pine timber. An effort is now being made to classify the areas within the blister-rust-control units.

In determining the sugar pine producing ability or yield expectancy of an area it is necessary to examine all information and data pertaining to that area. An examination of the available information revealed that data on some units or portions of units were insufficient for the proper classification of these lands. It was also found that much of the timber data were obsolete because of the vast amount of lumbering that has taken place during the past five years.

As a result of this study most of the areas needing additional information were listed and a program was inaugurated to secure these data as rapidly as possible. Four reconnaissance parties were organized and placed in the field in May and June by the Bureau of Entomology and Plant Quarantine, one crew was organized by the Plumas National Forest, and another crew by the Oregon and California Revested Lands Administration. These two latter crews were placed in the field in the fall after ribes eradication activities had ceased. In addition some work was done on the Eldorado and Stanislaus National Forests by the Bureau checkers stationed on those forests.

These data, in addition to their value in classifying sugar pine lands according to their yield expectancy and delimiting control unit boundaries, will be used as the basic information in planning ribes eradication programs especially on those units where no eradication work has been done.

METHODS OF WORK

Most of the methods used in performing reconnaissance work were similar to those used in the past. The section was used as the basic land unit. Four parallel strips were run at regular intervals in a cardinal direction. Distances were measured by pacing and courses were followed by use of a box compass. The strips were run as nearly at right angles to the main streams as a cardinal direction would permit so that the area covered by the strips would be more representative of the entire area than would be the case if the strips paralleled the main streams.

Each man worked alone and while running a strip he counted the ribes by species on a strip of area 1/4 chain wide and recorded them by five-chain

transects. He stopped at ten-chain intervals, laid out a 1/10 acre circular plot and counted the white pine trees by the four size classes: 0-6 feet in height, 6.1 feet in height to 3.5 inches DBH (diameter breast high), 3.6 inches DBH to 11.5 inches DBH and over 11.5 inches DBH. String lines were laid along opposite section lines of each section for control purposes.

Associated tree species were listed for each plot in the order of their numerical predominance; however, no counts were made. Two maps of the section were made as the reconnaissance man proceeded with his other work. One map showed the cultural and topographic features, site class boundaries, and the boundaries of the four yield expectancy groups for white pine stands. The other map showed the density of the brush and young trees as well as the brush species composing the ground cover.

The method of handling and applying the timber data after they were collected differed from that used in the past. The acreage covered by reconnaissance was grouped or typed according to the yield that could be expected from the white pine trees now present when these trees reached maturity. This expected yield depends upon the number of trees present and the quality of the site on which they are growing.

The four yield expectancy groups that have been established for sugar pine are:

Group 1 - Areas having a yield expectancy of 9,000 board feet or better of sugar pine per acre.

Group 2 - Areas having a yield expectancy of 4,500 to 9,000 board feet of sugar pine per acre.

Group 3 - Areas having a yield expectancy of 3,000 to 4,500 board feet of sugar pine per acre.

Group 4 - Areas having a yield expectancy of less than 3,000 board feet of sugar pine per acre.

The number of trees by size class occurring in each site class has been taken into consideration in establishing these expectancy yield groupings. Thus an attempt was made to evaluate the number of sugar pine trees needed in any of the four size classes or in a combination of two or more size classes to produce 3,000 board feet when the trees reach maturity. This minimum number of sugar pine trees needed has been calculated for the three site classifications used in blister-rust-control work. Since nearly all of the white pine volume in the Pacific Coast Region is composed of sugar pine a set of graphs and tables were made for use in determining the yield expectancy groups of an area from the counts taken on the timber plots. These same graphs and tables were used for the few trees of western white pine encountered as no comparable data were available for that species.

The six timber sites as used by the Forest Service in making their "Forest Condition" map were grouped into three general site classes for blister rust work. These groupings are:

Site A-200)
Site I-175)- Site Class A

Site 2-150)
Upper 1/2 Site 3-125)- Site Class B

Lower 1/2 Site 3-125)- Site Class C
Site 4-100)

Before doing any work in an assigned section the reconnaissance man would examine the "Forest Condition" map to determine what site class (A, B, or C) or classes were to be found within the section boundaries.

In computing sugar pine type or the minimum number of trees needed to form type each of the four size classes are considered. The average number of sugar pine trees necessary to meet the minimum requirements are given in the following table.

TABLE 1

MINIMUM SUGAR PINE COUNT BY SIZE CLASS
REQUIRED TO YIELD 3,000 BOARD FEET
AT ROTATION AGE

Diameter Size Classes	0-6'	6'-3.5"	3.6"-11.5"	Over 11.6"		All Size Classes	
				Cut-over	Mature	Cut-over	Mature
Trees Per Acre	38.0	8.6	5.2	1	3	52.8	54.8
Weight	25%	25%	25%	25%	25%	100%	100%

The average number of trees in each of the four size classes needed to yield 3,000 board feet per acre has been given an index weight of 25 per cent; hence, an index weight of 100 per cent meets the minimum requirement regardless of what combination of size classes goes into making up the total. Each 100 per cent unit of index weight is termed a "minimum"; hence, if there were enough trees on an area to give a weight of 300 per cent (when the trees of the four size classes have been weighed and totaled) the area was said to support three minimums. Once the number of sugar pine minimums has been determined and the site class is known, an area can be placed in its proper yield expectancy group.

A set of graphs and tables was made to facilitate the reconnaissance man in determining the yield expectancy group, of the area surrounding the one-tenth acre plot, from the sugar pine count on the plot. The graphs were based on the proportion of a minimum carried by one tree. A separate graph was made for each size class and these were plotted from the basic figures of:

1 tree on 1/10 acre plot in the 0-6' size class had .0658 minimums.

1 tree on 1/10 acre plot in 6.1'-3.5" size class had .29 minimums.

1 tree on 1/10 acre plot in 3.6"-11.5" size class had .48 minimums.

1 tree on 1/10 acre plot (mature) in 11.5" + size class had .83 minimums.

1 tree on 1/10 acre plot (cut-over) in 11.5" + size class had 2.5 minimums.

After the sugar pine count had been taken on the plot the number of trees in each size class was converted into weighted minimums. The weighted minimums for the four size classes were totaled and this figure was applied to the table in determining the yield expectancy group. The yield expectancy group table follows:

Group 1 - A yield of 9,000 board feet or better of sugar pine per acre.

Site Class A: More than 2.4 minimums.
Site Class B: More than 3.6 minimums.
Site Class C: More than 5.3 minimums.

Group 2 - A yield of 4,500 to 9,000 board feet per acre.

Site Class A: 1.2 to 2.4 minimums.
Site Class B: 1.8 to 3.6 minimums.
Site Class C: 2.6 to 5.3 minimums.

Group 3 - A yield of 3,000 to 4,500 board feet per acre.

Site Class A: 0.8 to 1.2 minimums.
Site Class B: 1.2 to 1.8 minimums.
Site Class C: 1.8 to 2.6 minimums.

Group 4 - A yield of less than 3,000 board feet per acre.

Site Class A: Less than 0.8 minimums.
Site Class B: Less than 1.2 minimums.
Site Class C: Less than 2.6 minimums.

Former ground cover density classes were slightly altered to fit the common practices being followed in blister-rust-control field activities. These are:

1. Density of 0 to 1 tenth.
2. Density of 1 to 3 tenths.
3. Density of 4 to 6 tenths.
4. Density of 7 to 10 tenths.

A symbol was assigned to each prominent brush species and when enough of any one species occurred on the ground to influence a man's progress or visibility it would be entered beside the density figure on the map. Ground cover density was taken at each timber plot.

LOCATION AND DESCRIPTION OF AREAS

Blister-rust-control reconnaissance work of 1946 was performed in both Oregon and California at those places where immediate information was needed by the ribes eradication forces. As a result the work was confined almost entirely to areas adjacent to ribes eradication operations.

Oregon

Work was performed on three forests in this state during the summer.

Siskiyou National Forest

The first crew started work in the Sucker Creek drainage basin in the extreme southeast corner of the forest. There are a few nice pockets of sugar pine in this area, but there are large holes in the sugar pine type due to brush fields and dense stands of Douglas and white fir. Since the ribes eradication work was being completed in the Bolan Lake control unit the adjacent sections along Sucker Creek were worked so that a definite unit boundary could be delimited.

The Sucker Creek area is rough, being composed of rather deep canyons and high ridges. The entire area sampled had from light to dense brush cover underneath the timber. About one-half the area had a light ground cover, one-third had a 5-7 tenths brush density and the rest or about 10 per cent had a brush density of from 8 to 10 tenths. There were five species of ribes found namely; *Ribes sanguineum*, *R. lacustre*, *R. cruentum*, *R. viscosissimum*, and *R. lobbi* (listed in order of their predominance). The reconnaissance crew found infected sugar pines at several of the timber plots. All of the 4,000 acres worked in this area belongs to the Forest Service.

Another reconnaissance crew started work at the Mt. Reuben area which is situated in the northeast corner of the forest. The sugar pine grows in a belt and in pockets along the ridge running from Mt. Reuben to Mt. Bolivar. In places there is a fair stand of sugar pine while in other places the pine is entirely replaced by Douglas fir.

This area is exceedingly steep and rough. Most of it is covered with an understory of brush varying from light to 10 tenths density. Of the 14,900 acres covered 6.7 per cent was free of brush, 28.6 per cent had a 2-4 tenths ground cover, 45.3 per cent had a 5-7 tenths ground cover, and 19.4 per cent had a cover of 8-10 tenths. There are few ribes along the north end of the unit as only an average of three per acre was found but most of the bushes were either *R. bracteosum* or *R. sanguineum*, the two most dangerous species. Parts of four sections worked in the vicinity of Mt. Reuben averaged from 1 to 40 bushes per acre per section. There were no bushes of *R. bracteosum* in this portion of the unit, however, there was an average of ten *R. sanguineum* bushes per acre. The ribes are grouped in patches and these occur mostly along streams and north facing slopes. Of the 14,900 acres covered in this area 1,460 were privately owned, 7,840 in O and C ownership and 5,600 under Forest Service jurisdiction.

During the latter part of the season the Oregon and California Revested Lands Administration established a small camp to do blister-rust-control reconnaissance work in the East Galice unit. This area lies outside the eastern boundary of the forest and about five miles east of Galice. The quality of the sugar pine at this area was about the same as that of the pine found elsewhere on the forest. Here again the sugar pine lies in pockets and belts with stands of almost pure Douglas fir displacing the pine on the areas between.

Ribes are few in number on the area covered and averaged only about 7 bushes per acre. Of the bushes present over a third were Ribes sanguineum with nearly all the others being R. cruentum. Practically all the ribes were found in two sections and even there they were in patches.

The brush was much lighter in density on this unit than it was on the other two areas. About 61 per cent of the 5,786 acres covered by reconnaissance had a ground cover of 2-4 tenths density, 31 per cent was covered with a density of 5-7 tenths and there were only 8 per cent of the area having a cover of 8-10 tenths. The O and C Administration has stewardship over 2,280 acres while the remainder of 3,506 acres are in private ownership.

Rogue River National Forest

The reconnaissance work on the Rogue River National Forest was performed in the vicinity of Prospect. Some of the area covered was within the control unit boundaries and was worked to ascertain whether enough sugar pine remained on the area following logging to warrant further control efforts. About 10 sections lying outside but adjacent to the southwest corner of the control unit were sampled to determine the amount of sugar pine present.

The area covered by reconnaissance is situated at the edge of good sugar pine stands and although there are fewer pines present than in the main unit the individual trees are of high quality. The sugar pine in this area occurs in belts and patches with Douglas and white fir filling in most of the gaps.

The ground cover in the Prospect area was very light when compared to other areas within the sugar pine stands of the Region. About 85 per cent of the area had a 2-4 tenths density or less of brush present. Only one per cent had a dense cover of brush on the ground.

There were seven species of ribes found while covering the area. Ribes bushes were generally few in numbers throughout most of the sections worked, however, of 2,980 bushes found 2,113 were in section 13, T. 32 S., R. 2 E. The species listed in order of their abundance are: R. viscosissimum, R. lobbi, R. sanguineum, R. lacustre, R. klamathense, R. cruentum, and R. binominatum. Of the 19 sections or parts of sections covered ribes were found in 16. All the ribes species except R. sanguineum were confined to one-half or less of the sections supporting ribes bushes. Ribes sanguineum was found in every section supporting bushes and was in third place in numbers found for any one species.

The Forest Service has stewardship over 2,960 of the 9,945 acres covered by the reconnaissance crew. The remaining 6,985 acres are in private ownership.

Klamath National Forest

The reconnaissance work on the Klamath National Forest was performed in the Long John Creek area which lies just north of the California-Oregon line in the northeast portion of the forest. Most of this country had the timber removed several years ago and nearly half of it is now covered with a medium to dense ground cover. The sugar pine occurs in belts and pockets with only about one-half the area actually covered by pine type.

The area supports a ribes population of about 40 bushes per acre. The six species found growing on the area listed in the order of their predominance are: Ribes lacustre, R. lobbi, R. cruentum, R. sanguineum, R. viscosissimum, and R. klamathense. Some infected pines were located along Cow and Long John Creeks indicating that the rust is beginning to become established.

All of the 6,080 acres covered in this area are in federal ownership. The O and C Administration has jurisdiction over 2,560 acres while the Forest Service administers the other 3,520 acres.

California

Work was performed on two forests by regular reconnaissance crews and on two others by checkers.

Klamath National Forest

Several thousand acres just south of the Oregon-California line in the northeast portion of the Klamath National Forest were covered by a reconnaissance crew. The crew spent part of its time working on the cut-over lands around Finley Gulch and the rest of the work was done in the vicinity of Doggett Creek. Most of this work was conducted to assist the ribes eradication forces in establishing control unit boundaries while the eradication camps were still working in the vicinity.

The ground cover on these two areas is fairly light as about 88 per cent of the acreage had a 2-4 tenths brush density or less. Eleven per cent of the area had a 5-7 tenths cover and there was less than one per cent of the area supporting a ground cover of 8-10 tenths density.

The ribes population was generally light since only 16 bushes were found per acre. Seven ribes species were represented namely: Ribes lobbi, R. binominatum, R. lacustre, R. cruentum, R. viscosissimum, R. klamathense, and R. sanguineum. The species were listed in the order of their occurrence with R. sanguineum having the fewest bushes present. This species had only about 2.5 per cent of the total ribes found - which probably accounts for the smallness of the number of infected trees found on the area worked.

Most of the area covered is in private ownership as only 4,540 acres out of a total of 13,440 were under Forest Service jurisdiction.

Plumas National Forest

A crew operated by the Bureau spent the entire season on the Plumas National Forest. In addition after the ribes eradication work was terminated the

Forest Service organized a crew which continued to do reconnaissance work off and on until early December. The work was performed around the edges of the main sugar pine stands and on areas from which the timber had been removed since the last reconnaissance coverage was made.

The crews took data on sections located in the vicinity of Walter's Mine, American House, Peoria Creek, Mountain House, Big Creek, and Lake Almanor. These areas are scattered from one end of the forest to the other. Since the work was confined mainly to the fringes of the better stands of sugar pine the timber was of marginal value due either to scarcity or to low quality. Reconnaissance work was conducted on these lands to determine whether they supported sufficient sugar pine to warrant the cost of protection from white pine blister rust.

Ribes data were not taken by the late season crew but there was a medium concentration of bushes present where data were taken. Only two species were found, namely Ribes roezli and R. nevadense. There was an average of 79 bushes per acre on the area covered of which 70 bushes were R. roezli. The ratio between species varied somewhat between areas and showed the greatest divergence at the Peoria Creek area where 23 per cent of the bushes present were R. nevadense.

The brush density varied from section to section but from area to area there was little difference except at American House where the ground cover was somewhat heavier. About 66 per cent of the area has a density of 2-4 tenths or less, 25 per cent had a 5-7 tenths density and 9 per cent was covered with density of 8-10 tenths.

The Forest Service has jurisdiction over 19,798 of the 34,485 acres worked.

Although pines infected with blister rust have been found on the forest none were found by the reconnaissance crews.

Eldorado National Forest

Some reconnaissance work was done by the checkers on the Eldorado National Forest. The areas covered had been cut-over since the previous data were taken and there was a question as to whether enough sugar pine was present to retain them in the control units. The sections or parts of sections covered were scattered from Van Horn Creek on the south to Uncle Tom's Cabin on the north. The ground cover was a little more dense than average. No ribes information was taken. Of the 2,600 acres covered 2,230 or 86 per cent are in federal ownership.

Stanislaus National Forest

The checkers on the Stanislaus National Forest performed some reconnaissance work on sections lying within the control unit boundaries which had been cut-over during the last few years. It was necessary to gather additional information to determine whether enough sugar pine was present to warrant further protective work. Some work was done in the Jawbone Creek drainage basin while the rest was done in the Fisher Creek drainage basin. The latter area had a very light ground cover present. No ribes data were taken on either area. Of the 8,900 acres covered on this forest 2,770 or 31 per cent are in federal ownership.

WORK PERFORMED AND RESULTS OBTAINED

Blister-rust-control reconnaissance data were taken on 100,136 acres on six national forests in Oregon and California. There was an average of 95.3 sugar pine trees and 36.2 ribes bushes per acre for the area on which data were collected.

Table 2 presents the summarized data per acre by national forest for each of the two states of the Pacific Coast Region. Within each forest the data were segregated by the four yield expectancy groups and for each group the acres covered, the sugar pine trees per acre in each size class, and the number of ribes per acre are shown.

Table 3 presents the ownership of the acres covered in both Oregon and California. In Oregon 12,680 acres of O and C lands, 16,080 of Forest Service lands and 11,951 acres in private ownership were covered by the reconnaissance crews. Of 59,425 acres worked in California the Forest Service has a total of 29,338 acres while the remainder of 30,087 are privately owned.

The acres in the four ground cover density classes were segregated by forests and presented in table 4. The percentage of each density class has been calculated. About two-thirds of all the acreage covered on reconnaissance during 1946 fell in the light brush cover class while the other third was composed of the medium to heavy brush cover.

TABLE 2

RIBES AND SUGAR PINE TREES BY SIZE CLASSES PER ACRE
BY YIELD EXPECTANCY GROUP BY FOREST FOR
OREGON AND CALIFORNIA - 1946

PART I - OREGON

Forest	Timber Groups	Acres Sampled	Number of Sugar Pines Per Acre					Ribes Per Acre
			0-6'	6'-3.5"	3.6"-11.5"	+11.5"	Total	
Rogue River	1	1,460	99.2	55.6	26.2	5.6	186.6	1.2
	2	980	88.6	24.7	5.3	1.6	120.2	0.9
	3	870	39.3	10.9	2.1	2.7	55.0	5.7
	4	6,635	10.0	2.0	0.1		12.1	33.6
	Total	9,945	33.8	13.1	4.7	1.3	52.9	24.1
Siskiyou	1	3,676	407.0	78.1	12.8	10.3	508.2	2.3
	2	4,690	153.6	22.3	6.8	7.2	189.9	6.0
	3	3,505	82.5	14.2	4.5	3.5	104.7	4.5
	4	12,815	19.3	3.1	0.8	0.7	23.9	14.0
	Total	24,686	110.9	19.4	4.2	3.7	138.2	9.7
Klamath	1	185	39.4	33.0	34.1	20.0	126.5	10.4
	2	1,400	62.2	24.3	8.8	9.0	104.3	25.7
	3	520	44.6	20.3	5.4	4.0	74.3	55.2
	4	3,975	15.7	4.0	0.6	0.9	21.2	45.3
	Total	6,080	30.6	12.0	4.8	4.1	51.5	40.2
Total Oregon	1	5,321	304.4	69.5	17.6	9.7	401.2	2.6
	2	7,070	126.7	23.0	7.0	6.7	163.4	9.1
	3	4,895	67.7	14.5	4.1	3.5	89.8	13.2
	4	23,425	16.2	3.0	0.6	0.5	20.3	24.4
	Total	40,711	80.3	16.8	4.4	3.2	104.7	17.7

TABLE 2 (Cont'd.)

RIBES AND SUGAR PINE TREES BY SIZE CLASSES PER ACRE
BY YIELD EXPECTANCY GROUP BY FOREST FOR
OREGON AND CALIFORNIA - 1946

PART II - CALIFORNIA

Forest	Timber Groups	Acres Sampled	Number of Sugar Pines Per Acre					Ribes Per Acre
			0-6'	6'-3.5"	3.6"-11.5"	+11.5"	Total	
Klamath	1	1,805	269.2	61.5	15.4	18.3	364.4	15.3
	2	3,230	104.7	19.7	5.2	11.0	140.6	11.3
	3	2,640	65.2	14.8	4.3	4.3	88.6	15.8
	4	5,765	25.6	4.0	0.6	1.2	31.4	20.4
	Total	13,440	88.8	18.4	4.7	6.8	118.7	16.5
Plumas	1	7,290	118.3	46.4	20.2	13.6	198.5	82.7
	2	5,650	75.3	14.2	7.9	7.6	105.0	66.5
	3	2,579	47.3	12.1	5.8	3.1	68.3	58.6
	4	18,966	14.0	2.4	1.0	0.2	17.6	83.6
	Total	34,485	48.4	14.3	6.5	4.4	73.6	78.6
Eldorado	1	400	41.7	16.1	8.9	3.9	70.6	
	2	680	54.0	13.7	5.0	6.0	78.7	
	3	300	21.3	16.7	4.0	8.0	50.0	
	4	1,220	13.8	3.7	1.2	0.5	19.2	
	Total	2,600	29.6	9.6	3.6	3.3	46.1	
Stanislaus	1	2,375	174.8	45.7	19.9	7.0	247.4	
	2	1,555	88.2	27.4	11.5	1.9	129.0	
	3	825	79.5	22.1	7.2	1.5	110.3	
	4	4,145	29.3	4.4	0.8	0.2	34.7	
	Total	8,900	84.4	21.4	8.5	2.5	116.8	
Total California	1	11,870	152.5	47.9	19.0	12.7	232.1	64.1
	2	11,115	84.4	17.5	7.4	7.8	117.1	38.6
	3	6,344	56.9	14.6	5.3	3.6	80.4	35.9
	4	30,096	18.2	3.1	0.9	0.4	22.6	65.1
	Total	59,425	62.0	16.1	6.2	4.6	88.9	56.3
Total Pacific Coast Region	1	17,191	200.8	54.7	18.6	11.7	285.8	35.9
	2	18,185	100.5	19.6	7.2	7.4	134.7	23.9
	3	11,239	61.3	14.5	4.8	3.5	84.1	25.2
	4	53,521	17.3	3.0	0.8	0.5	21.6	42.4
	Total	100,136	69.4	16.4	5.5	4.0	95.3	36.2

TABLE 3

STATUS OF OWNERSHIP OF AREAS COVERED ON
BLISTER RUST CONTROL RECONNAISSANCE BY NATIONAL FOREST
FOR OREGON AND CALIFORNIA - 1946

Forest	A C R E S O & C	Forest Service	Total Federal	Private	Total
Oregon					
Rogue River		2,960	2,960	6,985	9,945
Siskiyou	10,120	9,600	19,720	4,966	24,686
Klamath	2,560	3,520	6,080		6,080
Subtotal	12,680	16,080	28,760	11,951	40,711
California					
Klamath		4,540	4,540	8,900	13,440
Plumas		19,798	19,798	14,687	34,485
Eldorado		2,230	2,230	370	2,600
Stanislaus		2,770	2,770	6,130	8,900
Subtotal		29,338	29,338	30,087	59,425
Pacific Coast Region					
Total	12,680	45,418	58,098	42,038	100,136

TABLE 4

ACRES IN THE GROUND COVER DENSITY CLASSES FOR THE
NATIONAL FORESTS OF OREGON AND CALIFORNIA ON WHICH
BLISTER RUST CONTROL RECONNAISSANCE WORK WAS DONE - 1946

Forest	0-1 Acres	0-1 Per Cent	2-4 Acres	2-4 Per Cent	5-7 Acres	5-7 Per Cent	8-10 Acres	8-10 Per Cent	Total Acres	Total Per Cent
Oregon										
Rogue River	300	3.0	8,125	81.7	1,400	14.1	120	1.2	9,945	100.0
Siskiyou	1,040	4.3	9,961	40.3	9,960	40.3	3,725	15.1	24,686	100.0
Klamath	200	3.3	3,220	52.9	1,900	31.3	760	12.5	6,080	100.0
Subtotal	1,540	3.8	21,306	52.3	13,260	32.6	4,605	11.3	40,711	100.0
California										
Klamath	100	0.8	11,780	87.6	1,480	11.0	80	0.6	13,440	100.0
Plumas	540	1.6	21,783	63.1	8,852	25.7	3,310	9.6	34,485	100.0
Eldorado	620	23.9	820	31.5	860	33.1	300	11.5	2,600	100.0
Stanislaus	1,430	16.1	5,850	65.7	1,520	17.1	100	1.1	8,900	100.0
Subtotal	2,690	4.5	40,233	67.7	12,712	21.4	3,790	6.4	59,425	100.0
Pacific Coast Region										
Total	4,230	4.2	61,539	61.5	25,972	25.9	8,395	8.4	100,136	100.0

ANNUAL REPORT - 1946

DEVELOPMENT AND IMPROVEMENT OF CONTROL METHODS IN THE PACIFIC COAST REGION

By

THE BERKELEY OFFICE

Work Project BLR-1-6

PART IX

DEVELOPMENT AND IMPROVEMENT OF CONTROL METHODS IN THE PACIFIC COAST REGION DURING 1946

By

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FOREWORD

Development and improvement of control methods in the Pacific Coast Region during the 1946 field season included: (1) maintenance and checking of scheduled ribes ecology plots, (2) checking of chemical plots established in 1945, (3) further experimental tests of 2,4-D on the principal ribes species of Oregon and California, and (4) the practical use and testing of 2,4-D for the eradication of R. roezli by power spray rig.

Accomplishments of the 1946 field season in respect to the chemical eradication of ribes can be best summarized by stating that we have passed from developmental to practical use of 2,4-D for the eradication of R. roezli in the comparatively short time of one field season.

On the Plumas and Stanislaus National Forests some 328 acres bearing heavy populations of R. roezli were sprayed with 2,4-D, using 39,950 gallons of spray during 1,201 nozzle man-hours. Per acre averages for the season were: Number of ribes 827, gallons of spray 121, 8-hour nozzle man-days 0.456. The average cost of spray solution used was $0.0185 per gallon. At the end of the season a 10 percent line strip check of acreage on the Plumas N.F. showed an apparent kill of 93 percent on R. roezli. In mixed conifer type of the Sierra Nevadas, it now appears that R. roezli can be effectively treated from the time that the leaves are fully expanded in the spring until vegetative growth has nearly ceased in the late summer--tentatively, from the middle of May until the middle of August. Some inconsistencies in results can be expected from work done at the beginning and end of the spray season.

A small portable power sprayer was used to establish 233 half square rod (or sq. rod) uniform dosage plots. On these plots studies were made of susceptibility of various ribes, dosage, concentration, formulation of 2,4-D, spreader, marker, and the seasonal effect. These plots are also intended to serve as controls for the larger plots established at about the same time and under the same conditions with the large power unit.

Observations and records from the large plots, as well as the uniform dosage plots, indicated that the sodium salt, ammonium salt, triethanolamine salt, and the butyl ester of 2,4-D are equally effective on R. roezli when comparisons were made on the basis of the acid equivalent content of the several proprietary materials tested. Of the several markers used, Titanox B30, a commonly used white paint pigment, is considered to be the most effective on the score of visibility, cost, and bulk. Tergitol No. 7 was found to be a satisfactory spreader.

In the correlation of ribes ecology studies with control methods and timber management, encouraging cooperation was obtained in contacts made with the Timber Management Division of the Regional Office of the Forest Service and with the Pine Management Research personnel of the California Forest and Range Experiment Station. A visit to this region by Mr. DeJarnette, in charge of blister rust control for Region I of the Forest Service, and Mr. Moss of this Division, afforded an opportunity for several field conferences of Forest Service and Bureau personnel in Oregon and California. The findings made in Region I on silvicultural practices in relation to control methods were discussed in relation to similar problems in the Pacific Coast Region.

Section I of this report describes the progress of field work in methods for the chemical eradication of ribes. To facilitate understanding and use of ribes ecology data in control operations in the mixed conifer type of the Sierra Nevada, Section II has been prepared as a summary statement of the essential results of the past ten years' work on ribes ecology. Section III outlines laboratory, greenhouse, and special activities. Table 1 of the FOREWORD contains recommendations on the use of new herbicides for practical ribes eradication work in the Pacific Coast Region, summarizing the best information available through the fall of 1946.

TABLE 1. RECOMMENDATIONS ON THE USE OF NEW RIBICIDES FOR PRACTICAL RIBES ERADICATION WORK IN THE PACIFIC COAST REGION (Summarizes best information available through the fall of 1946)

Common name of chemical	Grade or type to be purchased for field use	Ribes species		Dosage per milacre 1/
Ammate 2/	du Pont's Ammate (contains 80% by weight of ammonium sulfamate plus inert materials)	R. binominatum		2.0 lbs. Ammate
		R. erythrocarpum		0.75 lb. Ammate
		R. inerme		2.0 lbs. Ammate
		R. lacustre (stream)		1.0 lb. Ammate
		R. lacustre (upland)		1.5 lbs. Ammate
		R. montigenum		1.5 lbs. Ammate
		R. tularense		1.0 lb. Ammate
2,4-D 3/	Sodium salt (Dow) Ammonium salt (du Pont) Triethanolamine salt 4/ Butyl ester (Sherwin-Williams)	R. bracteosum R. petiolare R. roezli	Class 1.	1/2 to 3 gals., depending on size of bushes. Thorough coverage of all leaves and stems to ground line plus crown drench for large, multiple crown bushes, especially those in class 2.
		R. cereum R. cruentum R. nevadense R. sanguineum R. viscosissimum	Class 2.	Concentration 500-750 p.p.m. acid equivalent. Use Titanox B30 as a marker and Tergitol No.7 as a spreader when equipment permits.

1/This is the basic dosage that would be applied per unit of ground fully occupied by ribes and is considered to be the average dosage for the species. In actual practice the gallonage needed to provide adequate coverage of any species will vary according to the size and density of the stems and foliage. For example, some stands of *R. lacustre* can be adequately treated by 3/4 of a gal. per M/A, while others may take as much as 2 gals.

2/Dissolve Ammate at rate of 1 lb. per gal. of water; apply as a combined aerial spray and soil drench, wetting all leaves and stems to the point of dripping and applying balance of dosage to crown centers. Tergitol or a similar spreader should be added to all Ammate sprays.

3/More specific recommendations on concentration of 2,4-D and time of year for best results on the several ribes species will be available early next field season. Further data on reactions of 2,4-D to ribes in class 2 (above) are needed.

4/Supplied by Standard Agricultural Chemicals Inc. or Dow Chemical Co.

SECTION I. THE DEVELOPMENT OF NEW HERBICIDES FOR RIBES ERADICATION

RESULTS OF 1945 FIELD WORK

2,4-D Tests.

Table 2 summarizes the results of 1945 tests of 2,4-D on 5 of the principal ribes of the Sierra Nevadas of California; table 3 gives similar data for 6 ribes occurring in control areas in Oregon. Analysis of data in these tables permits the following general conclusions:

1. Effectiveness of 2,4-D on all ribes varies with the season (growth vigor of the plants) being greatest during that period between the time that leaves are fully expanded and flowers fully developed until the fruits are fully sized.

2. Thorough coverage of all aerial parts (stems and leaves) down to the ground line is essential for kill of susceptible species such as R. roezli. For R. cereum and R. nevadense and other ribes in class 2 of table 1, a crown drench appears to be helpful in obtaining full effect of the chemical.

3. On R. roezli all forms of the 2,4-D herbicide, the acid, triethanolamine salt, ammonium salt, and sodium salt appear to be equally effective. Details of a typical R. roezli killed by 2,4-D are shown in BR-021 Plate 2. Addition of another herbicide such as furfural definitely reduced the toxicity of the 2,4-D to susceptible ribes.

4. No consistent correlations were noted for volume applied, 1 to 4 gals. per milacre, or for the several concentrations, 682 to 1250 parts per million (p.p.m.) on R. roezli. Sprouts occurred on 4-gallon plots as well as on 1-gallon plots, and the lowest concentration used (682 p.p.m.) showed just as good results as the higher concentrations.

5. Somewhat better results were secured on R. roezli occurring in the granitic soils of the Sierra N.F. than on those in the lava or mixed lava and granitic soils of the Plumas and Lassen. Since R. cruentum has been observed to be more resistant to 2,4-D than R. roezli, comparative results on the Plumas N.F. and Sierra N.F. may indicate that some intergrading of R. roezli and R. cruentum has occurred in the Plumas area.

6. The addition of a spreader (Tergitol No.7) did not increase (or lower) the percentage kill of ribes with the several forms and concentrations of 2,4-D employed. The practical role of a spreader is to prevent crewmen from spraying longer than is necessary to secure thorough wetting. Without a spreader the ribes bush doesn't look as wet as it actually is.

7. Ribes can be killed when application of liquid 2,4-D is restricted to ribes crown or soil, but the quantity of 2,4-D required exceeds that used in spraying the aerial plant parts.

8. The seasonal effect seemed to be more pronounced on R. cereum than on R. roezli. August treatments of R. cereum were significantly less effective than July and May work. (No tests on R. cereum were made in June.) R. nevadense showed the least variation in kill over the period May 22 to September 27. On the Shaver Lake plots there were significantly more seedlings on the spring than on the summer series. On eight spring plots, 220 R. roezli seedlings were counted (BR-021 Plate 2), while on nine summer plots there were just 31.

9. The addition of furfural, a penetrant and auxiliary herbicide, interfered with the toxicity of 2,4-D on R. roezli.

10. In any population of susceptible ribes there is a small percentage of individuals that are difficult to kill. On some of the plots there appeared to be no reason for failure to kill certain R. roezli.

Ammonium Sulfamate.

Further tests of Ammate (80% ammonium sulfamate) were made on R. roezli and R. lacustre; initial tests were made on R. binominatum, R. erythrocarpum, R. lobbii, and R. tularense. Results of these tests are given in table 4 and show that ammonium sulfamate is an effective all-purpose herbicide for ribes eradication. For species not susceptible to 2,4-D, ammonium sulfamate may be used as a crown treatment or as a combination crown drench and top spray for practical ribes eradication work. Ammate is bulkier, more expensive, and more corrosive to equipment than 2,4-D, and should be used only for eradication work that is difficult and costly for hand grubbing methods.

Diesel Oil Tests.

Attention is again called to the seedling occurrence data on the Chowchilla Mt. oil plots as given in table 5. Only four seedlings of 1946 origin were found on the 29 milacre plots this year. Many of the chemical plots have not produced a single seedling since the initial population of ribes was killed in 1938. This is indicative of what might be accomplished in reduction of workings by chemical methods.

TABLE 2. RESULTS OF 1945 FIELD TESTS OF 2,4-D ON FIVE RIBES SPECIES OF CALIFORNIA

Plot Location	Date Treated	No. of Tests	Method of Treatment	2,4-D Compound and P.P.M. Acid Equiv.	Other[1] Chemicals Added	Percent Kill Live Stem	Percent Kill Bushes
			Ribes cereum				
Sequoia N.F.							
Stony Creek	5/25	4	Uniform dosage (1,2,3,4)[3]	Na (682)	Terg.	90	80
	do.	1	Top spray and crown (1)	Na (682)	-	60	33
	8/2	2	Uniform dosage (1,3)	Acid (1000)[2]	Carb.	85	0
	do.	2	do. do.	Acid (1330)	Furf. + Terg.	87	0
	do.	1	Crown only (7 bu.)	Acid (1000)[2]	Carb.	0	0
	do.	1	do. (5 bu.)	Acid (1330)	Furf. + Terg.	0	0
Lassen N.F.							
Wilson Lake	7/13	2	Uniform dosage (3,4)	Acid (750)	Carb. + Trieth.	100	100
	do.	1	do. (1)	Acid (1500)	Trieth.	100	100
			Ribes inerme				
Lassen N.F.							
Battle Meadows	7/12	4	Uniform dosage (1,2,3,4)	Acid (750)	Carbonate	15	0
	do.	1	Top spray and crown (2)	Na (1137)	-	15	0
			Ribes nevadense				
Sierra N.F.							
Hogan Mt.	5/22	1	Top spray and crown (9 bu.)	Na (682)	-	100	100
do.	do.	1	Partial top & crown(10 bu.)	Na (682)	-	60	10
Shaver(Swanson PCG)	5/24	4	Uniform dosage (1,2,3,4)	Acid 750	Carb. + Terg.	92	50
do.	do.	1	do. (3)	Na (1137)	Terg. + Trieth.	100	100
(Peterson	8/23	1	Uniform dosage (1)	Acid (1250)	Furf. + Terg.	100	100
Millsite)	do.	1	do. (1)	do.	Furf.	100	100
do.	do.	2	do. (1,2)	do.	Carb.	100	96
do.	9/27	3	do. (1,2,3)	Na (1137)	Terg.	90	80
do.	do.	3	do. (1,2,3)	Na (1137)	Terg. + Furf.	95	85

1/ Terg. = Tergitol #7, a wetting agent; Carb. = Carbowax 1500, a solvent for the 2,4-D acid; furf. = furfural, a penetrant and also a herbicide; carbonate = sodium carbonate sufficient to convert the acid to its salt.

2/ 2,4-D proprietary mixture shipped from Washington. Content of 2,4-D acid estimated.

3/ Numbers marked (1,2,etc.) under method of treatment, means gals.per milacre; PT = practical test.

TABLE 2. RESULTS OF 1945 FIELD TESTS OF 2,4-D ON FIVE RIBES SPECIES OF CALIFORNIA (continued)

Plot Location	Date treated	No. of Tests	Method of Treatment	2,4-D Compound and P.P.M. Acid Equiv.	Other Chemicals Added	Percent Kill Live Stem	Percent Kill Bushes
			Ribes roezli				
Sierra N.F.							
Hogan Mt.	5/22	1	Top spray and crown	Na (682)	-	100	100
do.	do.	1	Partial top spray & crown	Na (682)	-	95	60
Shaver (Peterson	5/23	4	Uniform dosage (1,2,3,4)	Na (682)	-	98	95
do. Millsite)	do.	4	do. do.	Acid (600)	Carb.	99	95
do. do.	do.	1	Top spray and crown (PT 180 bu)	Na (682)	-	100	98
do. do.	do.	1	do. (5 bu.)	Acid (800)	Carb.+ Exc. NH_4OH	100	100
do. (Swanson PCG)	do.	1	Crown only (4 bu.)	Acid (800)	Carb.+Trieth.	75	75
do. do.	do.	4	Uniform dosage (1,2,3,4)	Acid (750)	Carb. + Terg.	100	70
do. do.	do.	1	do. (3)	Na (1137)	Terg. + Trieth.	100	100
do. (Peterson	8/23	3	do. (1,2,3)	Acid (1250)	Furf. + Terg.	99	93
do. Millsite)	do.	3	do. do.	do.	Furf.	98	75
do. do.	do.	3	do. do.	do.	Carb.	100	100
do. do.	9/27	6	do. (1,2,3)(1,2,3)	Na (1137)	Terg.	80	55
do. do.	do.	6	do. do.	Na (1137)	Furf. + Terg.	50	27
do. do.	do.	5	Dry chemical to soil surface (11.3-56.7 gms. M/A)	Na	-	5	0
Eldorado N.F.							
South Rubicon	8/21	3	Uniform dosage (1,2,3)	Acid (800) 2/	Carb.	50	10
do.	do.	3	do. do.	Na (1137)	Terg.	100	90
do.	do.	3	do. do.	Na (1137)	Furf. + Terg.	75	20
Plumas N.F.							
Mooreville Ridge	7/23	3	Uniform dosage (1,2,3)	Na (682)	Terg.	99	50
Lassen N.F.							
Wilson Lake	7/13	4	Uniform dosage (1,2,3,4)	Acid (750)	Carbonate + Terg.	100	85
do.	do.	1	Top spray and crown (PT 40 bu)	Na (1137	-	100	80
do.	do.	4	Uniform dosage (1,2,3,4)	Acid (750)	Carb. + Trieth.	97	37
do.	do.	1	Top spray and crown (PT 40bu.)	Acid (1500)	Trieth.	100	80
			Ribes tularense				
Sequoia N.F.							
Black Oak Trail	8/1	3	Uniform dosage (1,2,3)	Na (1137)	-	10	0
do.	do.	3	do. do.	Na (1137)	Furf. + Terg.	10	0

TABLE 3. RESULTS OF 1945 FIELD TESTS OF 2,4-D ON SIX RIBES SPECIES OF OREGON

Plot Location	Date Treated	No. of Tests	Method of Treatment	2,4-D Compound and P.P.M. Acid Equiv.	Other Chemicals Added	Percent Kill Live Stem	Percent Kill Bushes
			Ribes binominatum				
Rogue River N.F. Hershberger L.O.	7/17	1	Uniform dosage (2)	Na (682)	-	10	0
			Ribes cruentum				
Klamath N.F. Long John Ridge	7/19	1	Top spray and crown (7 bu.)	Acid (1250)	NH_4OH + Terg.	98	14
do.	do.	1	Crown only (4 bu.)	do.	do.	75	50
			Ribes erythrocarpum				
Rogue River N.F. Hershberger L.O.	7/17	3	Uniform dosage (1,2,3)	Na (454)	-	80	80
do.	9/6	3	do. do.	Acid (1250)	Furf.	10	0
			Ribes lacustre				
Klamath N.F. Long John Creek	6/3	4	Uniform dosage (1,2,3,4)	Acid (750)	Carb.+ Terg.	2	0
do.	6/17	4	do. do.	Na (682)	Terg.	2	0
do.	7/19	3	do. (1,2,3)	Acid (1250)	Terg. +Trieth.	2	0
			Ribes lobbii				
Klamath N.F. Long John Ridge	7/19	1	Top spray and crown (8 bu.)	Na (1137)	Terg.	15	0
			Ribes sanguineum				
Klamath N.F. Red Mt.	7/19	1	Top spray and crown (9 bu.)	Na (1137)	Terg.	100	100
Doe Peak	9/5	3	Uniform dosage (1,2,3)	Acid (1250)	Furf.	80	50

TABLE 4. RESULTS OF 1945 TESTS OF AMMONIUM SULFAMATE ON RIBES SPECIES OF CALIFORNIA AND OREGON

Plot Location	Date Treated	No. of Tests	Method of Treatment	Concentration and Dosage	Percent Kill	
					Live Stem	Bushes
			Ribes binominatum			
Rogue River N.F. Hershberger L.O.	7/17	2	Uniform dosage	1 lb. Ammate per gal. water (1,2) gals. per M/A	100	88
			Ribes erythrocarpum			
Rogue River N.F. Hershberger L.O.	7/17	3	Uniform dosage	1/2 lb. Ammate in 1 gal. water and 1 lb. in 2 and 3 gals. per M/A	100	99
			Ribes lacustre			
Klamath N.F. Long John Creek	7/19	3	Uniform dosage	1 lb. Ammate per gal. water and 1,2,3, gals. per M/A	100	100
			Ribes roezli			
Plumas N.F. Mooreville Ridge	7/23	1	Crown drench only (9 bu.)	1 lb. Ammate per gal. water and 1-8 pts. per bush	100	100
			Ribes tularense			
Sequoia N.F. Black Oak Trail	8/1	3	Uniform dosage	0.83 lb. Ammate per gal. water and 1,2,3 gals. per M/A	99	90

TABLE 5. RESULTS OF 1938 DOSAGE TESTS OF OIL MIXTURES ON SMALL RIBES ROEZLI BUSHES, CHOWCHILLA MT., SIERRA N.F., CALIFORNIA - SUMMARY OF DATA 1938-1946.

Plot No.	Dosage in Gals. Per Milacre	Oil Mixture Used	1938 Number Bushes on Plot	1938 Percent Bushes Killed	Number of Current Season Seedlings Removed From Plots '39	'40	'41	'42	'43	'44	'45	'46	Total '39-46	Total Fruiting Bushes Removed 1939-46	Non-fruiting Bushes Over 1 yr. Old, 1946 Check
28	0.5		195	90	15	13	8	7	-	5	-	4	52	12	1
1	1.0		43	93	-	-	-	-	-	-	-	-	-	2	-
2	1.5	SO_2	105	96	2	4	-	-	-	-	-	-	6	4	-
3	2.0	Extract	55	100	-	2	2	2	-	-	-	-	-	-	1
4	3.0		70	100	-	-	-	-	-	-	-	-	-	-	-
5	5.0		137	99	-	-	-	-	-	-	-	-	-	1	-
6	10.0		94	100	-	-	-	-	-	-	-	-	-	-	-
7	1.0		18	83	1	-	1	-	-	-	-	-	2	2	-
8	1.5		85	96	8	-	-	2	-	-	-	-	10	1	-
9	2.0	Diesel	76	93	4	-	4	-	-	1	-	-	9	3	-
10	3.0	Oil	56	100	-	-	-	-	-	-	-	-	-	2	-
11	5.0		59	100	-	-	-	-	-	-	-	-	-	-	-
12	10.0		35	100	-	-	-	-	-	-	-	-	-	-	-
13	1.0		58	71	54	26	15	18	-	-	-	-	113	9	5
14	1.5	Diesel	94	91	17	9	1	3	-	-	-	-	30	9	-
15	2.0	Oil	21	81	9	13	-	3	-	-	-	-	25	4	-
16	3.0	+	109	100	1	-	-	-	-	-	-	-	1	1	-
17	5.0	Crude Oil	110	95	1	8	-	-	-	-	-	-	9	6	-
18	10.0		65	100	-	-	-	-	-	-	-	-	-	-	-
29	0.5		57	100	24	38	1	-	-	-	3	-	66	-	-
19	1.0	SO_2	77	92	93	46	2	3	-	-	3	-	147	9	3
20	1.5	Extract	210	94	22	14	-	-	-	-	1	-	37	14	-
21	2.0	+	23	96	7	36	-	-	-	2	-	-	45	-	2
22	3.0	Diesel Oil	46	100	3	3	1	-	-	2	-	-	9	1	-
23	5.0		127	100	-	5	-	-	-	-	-	-	5	-	-
24	10.0		135	100	-	-	-	-	-	-	-	-	-	-	-
25	0		209	0	87	41	-	-	2	-	25	-	155	72	60
26	0	Control	25	0	137	96	1	3	-	-	3	-	240	27	-
27	0		170	0	81	15	7	-	-	8	35	-	146	90	43

PROGRESS OF CHEMICAL TESTS IN 1946

Equipment Used

Two spray outfits shown in plate 1 were used, a regular orchard type for large-scale crew work, and a small portable unit for measured dosage small-scale plot work.

The large outfit with a tank capacity of 200 gallons was mounted on a Chevrolet 1 1/2-ton, 4x4 Army Personnel Carrier (BR-017, plate 1). The pump, a "Bean Royal 15", was driven by a 3 h.p. Stover water-cooled gasoline engine, the assembly being geared to deliver 5 gallons of spray per minute. Pressures up to 300 pounds per square inch could be obtained with the horse power available. Mechanical agitation was employed to keep the marking material in suspension.

Pacific Marine NY portable fire pumps were used for filling the tank. These pumps deliver about one gallon per second under average working conditions.

The small portable outfit (BR-015, plate 1), weight about 65 pounds, under average working conditions delivered 2 to 3 gallons per minute at 75 to 100 pounds pressure from a Blackmer vane-type pump powered by a Lauson 1 h.p. air-cooled gasoline engine. A 10-gallon galvanized sheet metal tank served as the spray container.

Two sizes of hoses were used, regular 5/16" welding hose for lateral lines and for work close to the truck, and 1/2" hose of synthetic rubber reinforced with two plies of rayon tire cord for main lines when it was necessary to spray at considerable distance from the truck. All hose was equipped with Hansen pneumatic air-line fittings, the 5/16" with "3000 Series" and the 1/2" with "5000 Series." The Hansen fitting embodies a valve in one portion and permits the coupling and uncoupling of the hose while under pressure with little loss of solution.

Two types of spray heads were used--the Bean Majestic #307 nozzle (BR-018, plate 2) and the Bean short orchard guns #780 and #789 (BR-019, plate 2), the orchard guns being adjustable for long and short range work.

A small portable duster (BR-020, plate 2) supplied by Dow Chemical Co. was used for a few small dust plots. The unit consisted of 3/4 h.p. engine, blower, hopper, and 3-inch bore delivery tube. The assembly was mounted on a light frame and could be easily carried and operated by 3 men.

For the application of 2,4-D concentrates (30,000 p.p.m.), a small hand-operated plunger pump was used. Pressures up to 300 pounds per square inch were obtained.

Schedule of Tests with 2,4-D.

1. Practical tests.

The large truck-mounted unit was used to study practical or field operation problems in the eradication of ribes by chemical sprays.

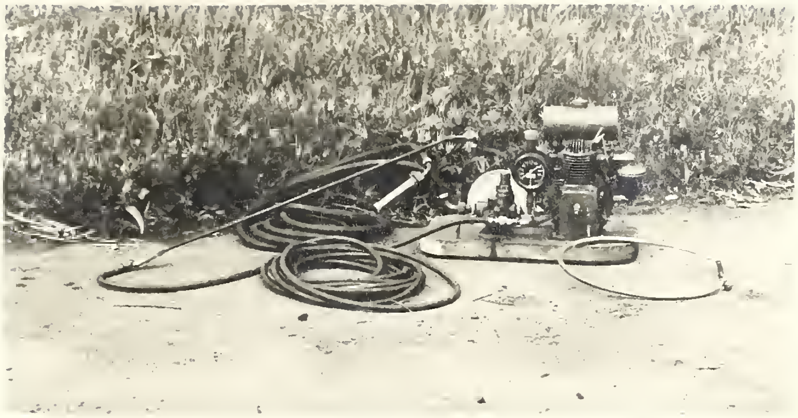
BR-018. Spraying R. roezli with 2,4-D, Jawbone area, Stanislaus N.F. 1946. Bean #307 nozzle bored to give solid cone spray. Note extra hose around operator's waist.

BR-019. Spraying R. roezli with 2,4-D using Bean #789 orchard-type spray gun, Stanislaus N.F. 1946.

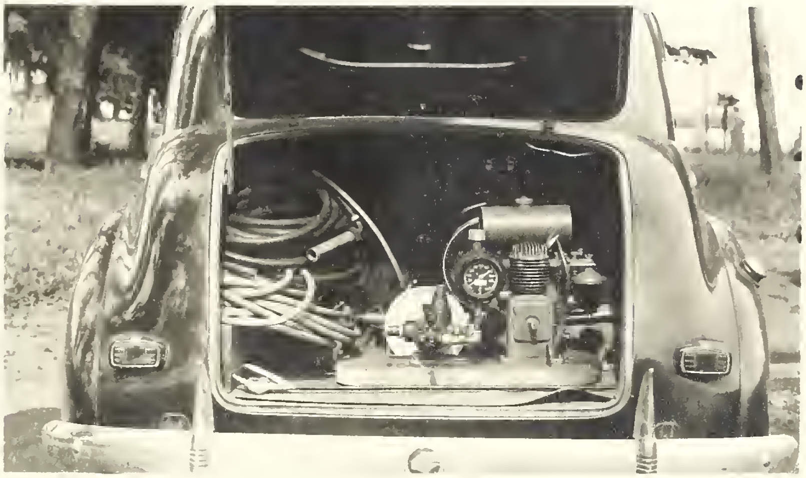
BR-020. Experimental dusting of R. roezli, Jawbone area, Stanislaus N.F. 1946. 2,4-D acid and Frianite dust is being applied at rate of 8 lbs. acid per acre.

BR-021. Detail of lower stems of R. roezli killed by May 1945 spray of sodium salt of 2,4-D, 682 p.p.m. acid equivalent. Note seedlings under dead bush. Seedlings were largely absent on mid-season plots.

Plate I.



BR-015. Portable power sprayer and accessories. The 1 h.p. air-cooled motor, and 10 g.p.m. vane-pump and wood base weigh 65 lbs. Unit delivers about 6 g.p.m. at 100 lbs. pressure.



BR-016. Pump unit, 10 feet of intake hose, 150 feet of 5/16" I.D. welding hose and all needed accessories except tank can be carried conveniently in the back of a sedan.

BR-017. Large power spray rig used for 1946 field work with 2,4-D. Note racks carrying 1200 feet hose on each side, and 2 Pacific Marine service pumpers. Spray on left is fan type; on the right hollow cone.

Plate 2.

It was recognized at the outset of the program that it would be impractical to study thoroughly all of the problems in a systematic manner in one season. Studies were therefore centered around (1) types of 2,4-D compounds, (2) markers, (3) wetting agents, (4) equipment, (5) working methods, (6) dosages and rates of application, and (7) species, seasonal and regional variations. Four types of 2,4-D compound were used, the dry powder form of water soluble ammonium and sodium salts, the water soluble triethanolamine salt (furnished in aqueous soln.), and the butyl ester in an emulsifiable (water miscible) oil. Since the 2,4-D sprays leave little or no residue on the leaves of the plants after drying, it was thought advisable to add some material to the spray solution which would leave a visible residue on the leaves. Four marking materials were extensively used, titanium dioxide paint pigments, wettable dusting sulphur, aluminum silicate, calcium carbonate. Several tests were made of a special tracer prepared by Sherwin-Williams Paint Company. Tergitol #7 was used as a spreader or wetting agent to reduce the surface tension of the spray solution, thus speeding up the wetting of the leaf surfaces of the ribes.

Two geographical areas of the Sierras were selected for spraying at different times during the season to determine regional and seasonal variations in ribes susceptibility and to locate the work on diverse types of soil as shown in table 6.

Work was undertaken and subsequently analyzed (table 9) by four periods which correspond to the seasonal development of the ribes as follows: (1) Spring, May 17 to June 11. Flowers coming out, fruits starting to form, and vegetative growth starts. (2) Early summer, June 12 to July 31. Fruits maturing and major part of vegetative growth occurs. (3) Late summer, August 1 to August 31. Fruits maturing and falling, vegetative growth practically ceased, soil becomes dry. (4) Autumn, September 1 to September 26. Leaves starting to fall, some frost, all fruits gone.

TABLE 6. AREAS WHERE PRACTICAL TESTING OF 2,4-D SPRAYS WAS UNDERTAKEN IN 1946

	Northern (Plumas N.F.)			Southern (Stanislaus N.F.)			
	Lava Top	Lewis Ridge	Rock Creek	Camp No. 41	Jawbone Creek	Crane Meadows	Hazel Green
Soil type	Lava	Granitic	Lava-granitic	Meta-granitic	Granitic	Granitic	Meta-morphic

Table 7, 1946 tally sheet of spray plots and acres sprayed with 2,4-D, shows the scope of the work done covering all chemicals and combinations used by the large rig. The tally sheet further breaks down the work by 2,4-D compounds, forests, marker, spreader, date sprayed, and concentration of 2,4-D in parts per million. The plot numbers are given for reference and the total plots and acres are added for comparison. It may be noted that the acreage varies from 0.2 to 73.8 acres for any one condition listed.

A 10 percent advance check was made at the time of the spraying to delimit the spray area, to obtain a bush count, and to map the plots on a 32-inch per mile scale for future reference. Plot data and spray data were kept on the reverse side of the spray plot maps for ready reference in the field and office (see figure 1 for sample). The spray and ecological data were recorded on special data sheets for each plot. The percent kill was obtained from a 10 percent regular check made 37 to 116 days following the spraying. Information was kept on the bushes apparently missed and those not completely killed.

From the daily eradication reports a summary table by sections (table 8) was made to show the number of each species of ribes as well as the total acres and total nozzle man-days. Section 26 includes 4.2 acres and 4,339 ribes sprayed with concentrates that are not included in other tables in this report.

A general summary (table 9) of all the 2,4-D spray work during 1946 was made to show the results of the spray work and the relationship of several important factors to the effectiveness of that work. This analysis will be of particular value in planning future work; thus it appears that one gallon of spray will cover about 200 feet of ribes live stem.

Analysis of Results From Fall Check.

A 10 percent first regular check was made on 16 percent of the area 37 to 60 days after spraying. A 10 percent final 1946 regular check was made on all the Plumas spray work. These checks were made in accordance with the methods prescribed for regular checking in the Pacific Coast Region except that the check strips were run over the same strips as the advance check and not at right angles to them.

Effectiveness of 2,4-D spray on Ribes roezli (table 10) is shown by forests, 2,4-D marker, and seasons. No regular check was made on any triethanolamine plots. Among the other three 2,4-D compounds there appear only slight differences in effectiveness. However, at the time of the regular check the plots with Desert Whiting on the Stanislaus N.F. showed more live sprayed bushes than were found with other markers. The sulphur and Titanox as markers, showed the fewest live bushes, i.e., best kill.

The effectiveness of the 2,4-D spray shown on the first regular check on the Stanislaus indicates 97.9 percent of the treated R. roezli and 92.3 percent of the R. nevadense were apparently killed.

Sprouts from bush crowns not completely killed averaged 1.06 percent for all the area given a regular check. The Plumas final regular check showed an average of 1.58 percent sprouts, while the Stanislaus first regular check showed an average of 0.33 percent sprouts.

On the area given a regular check there were 3.65 percent of the bushes missed and 1.57 percent of the feet of live stem missed within the spray plots. An average of 49 bushes per acre and 687 feet of live stem per acre were left unsprayed. The 2,4-D at 720 p.p.m. averaged only 0.43 percent sprouts for the sodium salt, 1.17 percent for ammonium, and 1.83 percent for butyl ester. At 1,440 p.p.m. the ammonium salt had only 0.27 sprouts.

Page 1 of 3

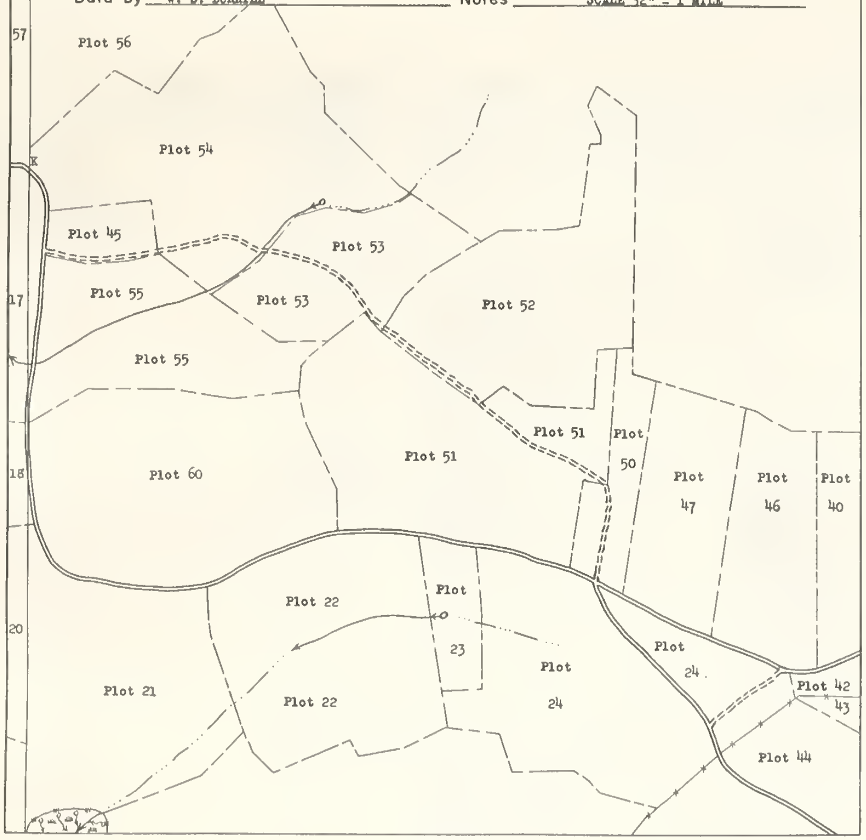
W 1/4 Cor.

BLISTER RUST CONTROL

Operation STANISLAUS   2,4-D SPRAY PLOT Map   T. 2 N. R. 18 E. Section 25

Drawn by BURRILL   Month and Year JUNE - AUGUST 1946   Acres in Section 51.2

Data by W. S. BURRILL   Notes SCALE 32" = 1 MILE



FRONT

Section 25, T. 2 N, R. 18 E.

SPRAY PLOT DATA

Plot No.	Ribes Per Acre	F.L.S. Per Acre	Total Acres	Total Ribes	Total F.L.S.	Nozzle Man Hours	Date Sprayed	2,4-D	Oono. ppm	Spreader	Marker	Gal. Spray	Gal. Per Acre	Per Cent Kill, Apparent
21	648	20,913	3.5	2,268	73,195	12.0	6/7	Butyl Ester	720	Terg.	Desert White	600	171	89.1
22	660	17,733	4.2	2,772	74,479	21.0	6/9	Na	720	Terg.	Titanox	400	95	90.3
23	730	14,950	0.6	438	8,970	3.0	6/11	Na	720	Terg.	Titanox	100	167	94.5
24	1,357	55,707	4.4	5,971	245,111	27.0	6/11	NH_4	720	Terg.	Titanox	1,200	273	96.9
40	967	14,400	0.8	774	11,520	3.5	7/23	Na	720	None	Titanox	200	250	
41	573	17,433	1.1	630	19,176	3.5	7/22	Na	1,440	None	Titanox	200	182	
42	1,376	52,940	1.7	2,339	89,898	9.0	7/24	Na	720	Terg.	Titanox	600	353	
43	933	23,200	0.5	467	11,600	5.0	7/24	Na	1,440	Terg.	Titanox	500	1,000	
44	1,500	31,000	1.6	2,400	49,600	14.5	7/26	Na	720	Terg.	Titanox	800	500	
45	1,680	39,600	0.4	672	15,840	2.5	7/26	Na	720	Terg.	Titanox	50	125	
46	943	32,057	1.7	1,603	54,497	12.0	7/26	Na	360	None	Titanox	575	338	
47	1,360	51,077	1.7	2,312	86,831	10.0	7/29	Na	360	Terg.	Titanox	450	265	
50	1,069	34,347	0.8	855	27,478	5.0	7/31	NH_4	360	None	Titanox	185	231	
51	554	20,400	4.7	2,604	95,880	10.0	7/31	NH_4	720	None	Titanox	400	85	
52	307	8,844	3.0	921	26,532	6.0	8/1	NH_4	1,440	None	Titanox	190	63	
53	640	23,975	1.9	1,216	45,553	6.0	8/1	NH_4	1,440	Terg.	Titanox	240	126	
54	418	12,428	4.3	1,797	53,440	15.0	8/2	NH_4	720	Terg.	Titanox	600	140	
55	1,053	18,422	2.4	2,527	44,213	12.0	8/5	NH_4	360	Terg.	Titanox	450	188	
56	314	11,531	3.4	1,068	39,205	9.0	8/5	Butyl Ester	360	None	Titanox	185	54	
59	484	9,143	4.2	2,033	38,401	14.0	8/8	Butyl Ester	1,440	None	Titanox	380	90	
60	377	7,100	4.3	1,621	30,530	3.0	8/9	Butyl Ester	360	Terg.	Titanox	110	26	
Total	728	22,304	51.2	37,288	1,141,949	203.0						8,415	164	

BACK

FIGURE 1.

SAMPLE OF FIELD MAP RECORD

TABLE 7

1946 TALLY SHEET OF SPRAY PLOTS AND ACRES SPRAYED WITH 2,4-D IN PRACTICAL TESTS

2,4-D	Forest	Marker	Spreader	Date	Concentration of 2,4-D: 360 p.p.m. Plot No.	360 p.p.m. Acres	720 p.p.m. Plot No.	720 p.p.m. Acres	1,440 p.p.m. Plot No.	1,440 p.p.m. Acres	Total Plots	Total Acres
Sodium	Plumas	Titanox B-30	Tergital #7	5/16-20			1-3	3.3			3	3.3
	Plumas	Velvet White	Tergital #7	5/20-21			4	2.5			1	2.5
	Plumas	Desert White	Tergital #7	5/23			7	1.8			1	1.8
	Stanislaus	Titanox B-30	Tergital #7	6/4-6			18, 19	10.0			4	14.8
				6/9-11			22, 23	4.8				
	Stanislaus	Titanox B-30	Tergital #7	7/23-29	47	1.7	42, 44, 45	3.7	43	0.5	10	74.3
				8/15-30			69-73	68.4				
	Stanislaus	Titanox B-30	None	7/22-29	46	1.7	40	0.8	41	1.1	3	3.6
	Stanislaus	Sulphur	Tergital #7	5/31			14	0.3			3	1.5
		Desert White					15	0.3				
		Velvet White					16	0.9				
Butyl Ester	Plumas	Velvet White	Tergital #7	5/21-24			5	2.7			3	12.0
		Desert White					6	2.3				
		Titanox B-30					8	7.0				
	Stanislaus	Titanox B-30	Tergital #7	8/9-12	60	4.3	61	5.7	62	6.9	3	16.9
	Stanislaus	Titanox B-30	None	8/6-8	56	3.4	57	8.6	59	4.2	3	16.2
	Stanislaus	Sulphur	Tergital #7	5/31			13	0.3			3	7.0
		Desert White		6/7			20, 21	6.7				
Ammonium	Plumas	Sulphur	Tergital #7	6/27			32	2.7			10	27.6
		Velvet White		6/28-7/3			33, 34	4.6				
		Titanox B-30		6/24-27			30, 31	5.0				
				7/3-15			35, 38	6.6	39	0.6		
		None		7/1-5			36, 37	8.1				
	Stanislaus	Titanox B-30	Tergital #7	5/28, 6/3, 11			9, 17, 24	7.9			14	109.3
				6/17-20, 7/30			27, 29, 48, 49	13.3	28	4.4		
				8/1-7	55	2.4	54, 58	5.6	53	1.9		
				9/5-26			74, 75	73.8				
	Stanislaus	Titanox B-30	None	7/31-8/1	50	0.8	51	4.7	52	3.0	3	8.5
	Stanislaus	Sulphur	Tergital #7	5/28-29			10	0.2			5	10.5
		Desert White					11	0.5				
		Velvet White					12	1.7				
		Sulphur		6/14-17			25	4.0				
		Desert White					26	4.1				
Triethanolamine	Stanislaus	Titanox B-30	Tergital #7	8/13-15	66	1.6	67	2.6	68	2.4	3	6.6
	Stanislaus	Titanox B-30	None	8/12-13	63	2.2	64	3.6	65	1.6	3	7.4
Total Plots and Acres -					8	18.1	57	279.1	10	26.6	75	323.8

TABLE 8

1946 SUMMARY BY SECTIONS AND FORESTS OF THE 2,4-D SPRAY PROJECT

Location			Acres	Nozzle Man Days	Ribes roezli	Ribes nevadense	Ribes cereum	Ribes Total
Sec.	Twp.	Rge.						
Stanislaus National Forest								
12	2S	18E	7.7	6	5,491	1,748		7,239
13	2S	18E	1.6	1 2/8	1,381			1,381
18	2S	19E	8.1	3 3/8	12,865	28		12,893
11	1N	18E	3.2	1 2/8	5,762	40		5,802
25	2N	18E	51.2	25 3/8	35,527	1,745	16	37,288
26	2N	18E	185.3	63 1/16	130,476	2,167	10	132,653
19	2N	18E	5.2	6/8	2,200		10	2,210
30	2N	19E	18.5	4	4,651	464	10	5,125
Total			280.8	105 1/16	198,353	6,192	46	204,591
Plumas National Forest								
8	20N	8E	3.0	5 3/8	6,191	210		6,401
14	21N	7E	6.0	12 11/16	28,442			28,442
19	21N	8E	18.6	15 3/16	15,650	281		15,931
20	21N	8E	16.3	9 6/8	14,618	20		14,638
30	21N	8E	3.3	2 6/8	1,395			1,395
Total			47.2	45 6/8	66,296	511		66,807
Grand Total			328.0	150 13/16	264,649	6,703	46	271,398

Section 26 includes 4.2 acres and 4,339 bushes sprayed with concentrates. These figures are not included in some of the other tables.

TABLE 9

1946 GENERAL SUMMARY AND ANALYSIS OF 2,4-D SPRAY WORK BY SEASON AND FOREST

	Spring		Early Summer		Late Summer	Autumn	Totals		
	Plumas	Stan.	Plumas	Stan.	Stan.	Stan.	Plumas	Stan.	Total
Total Acres Sprayed	19.6	33.6	27.6	40.8	132.6	73.8	47.2	280.8	328.0
Total Ribes Sprayed	16,033	46,307	50,774	44,181	87,353	26,750	66,807	204,591	271,398
Total Nozzle Man Days	12 1/2	26 5/8	33 2/8	22	39 6/8	16 11/16	45 6/8	105 1/16	150 13/16
Total Gallons of Spray	2,460	7,960	7,940	6,715	10,925	4,950	10,400	30,550	40,950
Total F.L.S. Sprayed	642,529	2,141,310	1,246,949	1,207,550	2,388,470	453,668	1,889,478	6,190,998	8,080,476
Average Ribes Per Acre	818	1,378	1,840	1,083	659	362	1,415	729	827.4
Nozzle Man Days Per Acre	0.64	0.79	1.20	0.54	0.30	0.23	0.97	0.37	0.46
Acres Per Nozzle Man Day	1.57	1.26	0.83	1.85	3.34	4.42	1.03	2.67	2.17
F.L.S. Per Acre	32,782	63,729	45,179	30,562	18,012	6,147	40,031	22,047	24,635
Ribes Per Nozzle Man Day	1,283	1,393	1,527	2,008	2,198	1,603	1,460	1,947	1,800
Average Bush Size	40'	46'	25'	28'	27'	17'	28'	30'	30'
Ribes Per Gallon Spray	6.52	5.82	6.39	6.58	8.00	5.40	6.42	6.70	6.63
F.L.S. Per Gallon Spray	261	269	157	180	219	92	182	203	197
Gallons of Spray Per Acre	126	237	288	165	82	67	220	109	125
Gallons of Spray Per Nozzle Man Day	198	299	239	305	275	297	227	291	272
Total Cost of Spray	$53.88	$145.48	$133.44	$124.89	$225.48	$86.30	$187.32	$582.15	$769.47
Cost of Spray Per Acre	$2.75	$4.33	$4.83	$3.06	$1.70	$1.17	$3.97	$2.07	$2.35

TABLE 10

EFFECTIVENESS OF 2,4-D SPRAY ON RIBES ROEZLI[a]

Per Cent Bush Kill (Apparent) by 2,4-D, Marker, and Season
(From 1946 Regular Checks on 25 Per Cent of Total 1946 Spray Area)

2,4-D	p.p.m.	Marker	Stanislaus First Reg. Check	Plumas Final 46 Reg. Check	Average
Sodium	720	Titanox B-30	98.1	-	98.1
		Velvet White	94.4	94.9	94.6
		Desert White	81.2	96.5	91.5
		Sulphur	96.9	-	96.9
Butyl Ester	720	Titanox B-30	-	93.1	93.1
		Velvet White	-	96.8	96.8
		Desert White	98.3	97.7	98.1
		Sulphur	99.8	-	99.8
Ammonium	720	Titanox B-30	99.2	97.5	98.0
		Velvet White	98.5	97.2	97.7
		Desert White	95.5	-	95.5
		Sulphur	98.9	95.8	96.4
		None	-	96.6	96.6
	1,440	Titanox B-30	...	98.6	98.6
Sodium	720	All	96.3	95.6	96.2
Butyl Ester	720	All	98.9	94.7	96.4
Ammonium	720	All	98.7	97.2	97.6
All	-	Titanox B-30	98.6	96.9	97.6
		Velvet White	97.2	96.8	96.9
		Desert White	93.5	97.0	95.1
		Sulphur	98.9	95.8	97.6
Spring			97.7	95.1	96.8
Early Summer			-	97.3	97.3
Average			97.7[b]	96.8	97.2

[a] Includes less than one per cent Ribes nevadense.

[b] First regular check on Stanislaus showed 92.3 per cent apparent bush kill for Ribes nevadense.

Dosage Tests.

Table 11, 1946 tally sheet of measured dosage test plots of 2,4-D spray, shows important data for the 233 small test plots established in the course of further experimental work. The formulations in p.p.m. of 2,4-D plus other chemicals are shown for all conditions tested. The California plots are chiefly on the Stanislaus with smaller numbers on the Plumas, Lassen, and Sierra Forests. All the Oregon plots are on the Rogue River and Klamath Forests. The majority of the plots are either 1/2 or 1 sq.rod in size, and were given a uniform dosage at the rate of 5 or 10 gallons of spray per square rod. The ribes species and date sprayed are also shown, together with the plot numbers and total plots.

Items 8 and 46 represent resprays of parts of plot 7. Bushes on this plot showed many crown sprouts and partially killed bushes following the original treatment. Plot 7 was originally sprayed by the large rig with sodium salt and Desert White. Line 48 shows a respray of R. lacustre on plots 11 and 12 in the 1945 series. On line 41, the 100 percent 2,4-D acid was soaked for 62 hours prior to spraying. Items 19 and 33 draw attention to tests of compatibility between 2,4-D and titanium dioxide markers. The materials were combined in a gallon of water and allowed to soak for over 48 hours before application.

A detailed check of all small dosage plots will be made in 1947. No further analysis of this phase of the 1946 experimental work is now justified.

Comments on 1946 Work.

The spray project, as set up for the 1946 season should be regarded as a developmental job since it combined practical and experimental objectives.

The spray machine was under-powered and the capacity of 5 gallons per minute and the maximum pressure of 300 pounds were both too low for some of the conditions encountered. A crew of 4 men was assigned to the truck. One served as foreman, truck driver, engineer, and hose-man. The other 3 men served as nozzle-men but for a considerable portion of the time only 2 men sprayed and the extra man helped on measured dosage plots. For these reasons no attempt has been made to show total operating costs. A cost figure 20 to 30 percent higher than the nozzle-man-days shown in the tables and charts would take into account the operator's time. The pump, if adequately powered, could supply spray for 4 to 6 nozzle-men at any pressure desired.

Figure 2 shows the regression of number of ribes per acre and gallons of spray solution used per acre. At the average of 825 ribes per acre about 125 gallons of spray solution per acre were used.

Figure 3 shows the regression of number of ribes per acre and acres per nozzle-man-day. From table 9 it may be noted that an over-all average of 827 ribes per acre was sprayed at the rate of 2.17 acres per nozzle-man-day. This figure is considerably higher than that taken from the curve shown in figure 3.

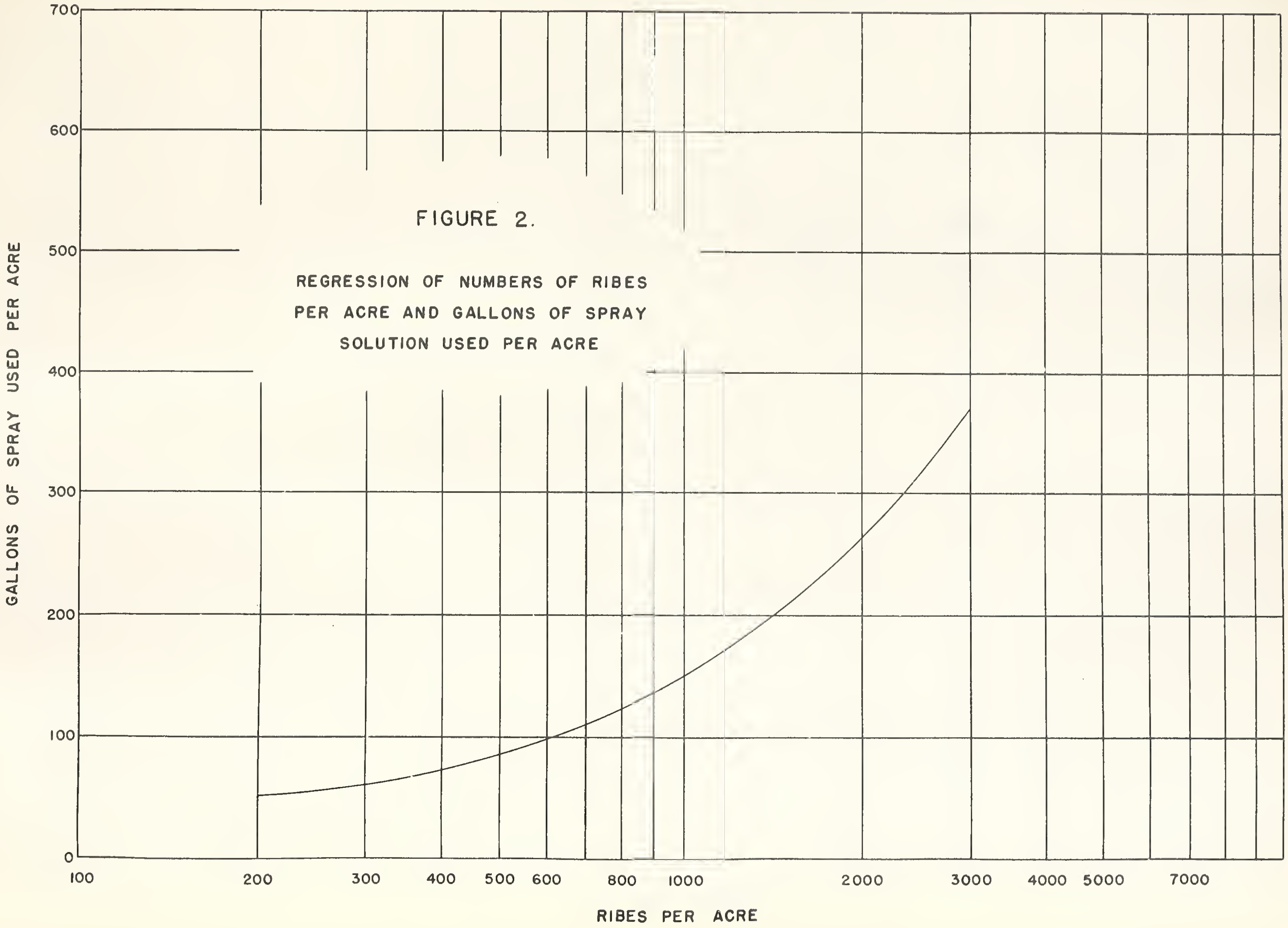


FIGURE 2.

REGRESSION OF NUMBERS OF RIBES PER ACRE AND GALLONS OF SPRAY SOLUTION USED PER ACRE

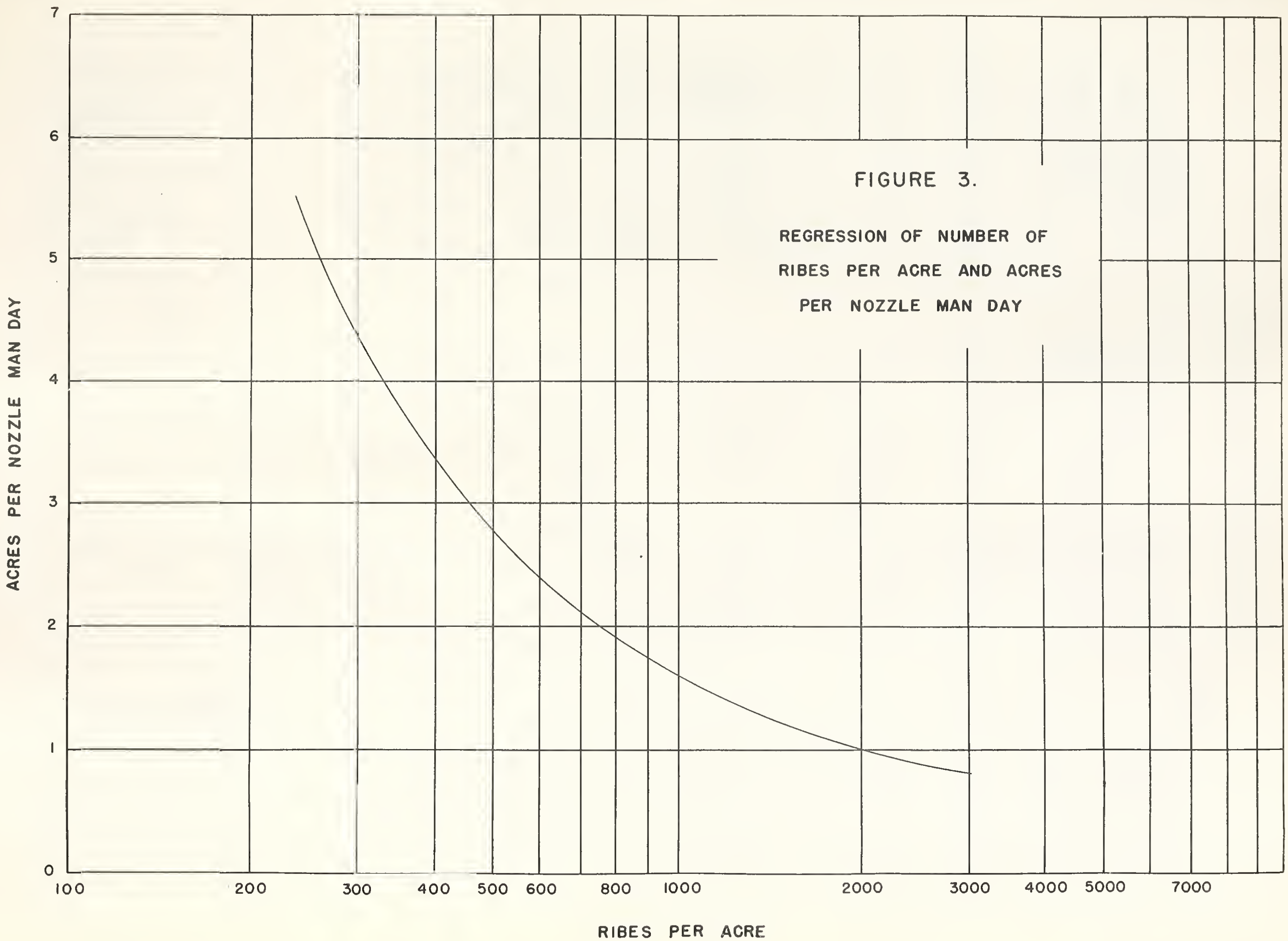


FIGURE 3.

REGRESSION OF NUMBER OF RIBES PER ACRE AND ACRES PER NOZZLE MAN DAY

TABLE 11

1946 TALLY SHEET OF MEASURED DOSAGE TEST PLOTS OF 2,4-D SPRAY

Item	Formulations in p.p.m. 2,4-D + Other Materials	Forest	Marker	Spreader	Plot Size Sq. Rod	Dosage Gal. Per Sq. Rod	Ribes	Date	Plot Numbers	Total Plots
1	Sodium - 720, 360, 180, 90	Stanislaus	None	Tergital #7	1/2	10	roezli nev.	6-3	132-135	4
2	Sodium - 1,440, 720, 360, 180	Stanislaus	None	None	1/2	10	roezli	7-23	176-179	4
3	Sodium - 1,440, 720, 360, 180, 90	Stanislaus	None	Tergital #7	1/2	10	roezli	7-23	180-184	5
4	Sodium - 720, 360, 180, 90	Stanislaus	None	Tergital #7	1	5	roezli nev.	6-4	144-147	4
5	Sodium - 720, 360, 180, 90	Plumas	Velvet White	Tergital #7	1/2	10	roezli	5-21	109-112	4
6	Sodium - 360, 180, 90	Plumas	Desert White	Tergital #7	1/2	10	roezli	5-23	117-119	3
7	Sodium - 360, 180, 90	Plumas	None	Tergital #7	1/2	10	roezli	6-26	156-158	3
8	Sodium - 1,440, 720 (Respray of part of plot 7)	Plumas	None	Tergital #7	Irreg.	10	roezli	8-22	317, 318	2
9	Sodium - 480, 240, 120, 60	Sierra	None	Tergital #7	1/2	10	roezli	5-9	101-104	4
10	Butyl Ester - 720, 360, 180, 90	Stanislaus	None	Tergital #7	1/2	10	roezli nev.	6-3	128-131	4
11	Butyl Ester - 1,440, 720, 360, 180, 90	Stanislaus	None	None Tergital #7	1/2	10	roezli	7-24	185-194	5 5
12	Butyl Ester - 720, 360, 180, 90	Stanislaus	None	Tergital #7	1	5	roezli	6-4	140-143	4
13	Butyl Ester - 720, 360, 180, 90	Plumas	None	Tergital #7	1/2	10	roezli	5-22	113-116	4
14	Butyl Ester - 720, 360, 180, 90	Plumas	Titanox B-30	Tergital #7	1	5	roezli	5-24	120-123	4
15	Butyl Ester - 720, 360, 180, 90	Plumas	None	Tergital #7	1 1/2	10	roezli	6-26	148-155	4 4
16	Butyl Ester - 1,440, 720, 360, 180, 1,440	Plumas	None	Tergital #7	1/2	10	roezli	7-15	171-175	3 2
17	Butyl Ester - 1,440, 720	Lassen	None	Tergital #7	Irreg.	15	cer.	8-13	284, 285	2
18	Butyl Ester - 480, 240, 120, 60	Sierra	None	Tergital #7	1/2	10	roezli	5-9	105-108	4
19	Ammonium - 1,440, 720, 360, 180, 90	Stanislaus	Titanox B-30 Titanox AWD Titanox RC-HT-X	Tergital #7	1/2	10	roezli	8-6	239-253	5 5 5
20	Ammonium - 720, 360, 180, 90	Stanislaus	None	Tergital #7	1/2	10	roezli	6-3	124-127	4
21	Ammonium - 720, 360, 180, 90	Stanislaus	None	Tergital #7	1	5	roezli nev.	6-4	136-139	4
22	Ammonium - 1,440, 720, 360, 180, 90	Stanislaus	None	None Tergital #7	1/2	10	roezli	8-1	203-212	5 5
23	Ammonium - 1,440, 720, 360, 180, 90	Stanislaus	None	Tergital #7	1/2	10	roezli	9-3 9-17	324-333	5 5
24	Ammonium - 720, 360, 180, 90	Plumas	None	Tergital #7	1/2 1	10 5	roezli	6-26	159-166	4 4
25	Ammonium - 1,440, 720, 360, 180	Plumas	None	Tergital #7	1/2	10	roezli	7-15	167-170	4
26	Ammonium - 1,440, 720, 360, 180, 90	Lassen	None	Tergital #7	1/2	10	roezli	8-13	279-283	5
27	Ammonium - 1,440, 720	Lassen	None	Tergital #7	Irreg.		cer.	8-13	286, 287	2
28	Ammonium - 1,440, 720, 360	Klamath	None	Tergital #7	Irreg.		cruen.	8-15	289-291	3
29	Ammonium - 1,440, 720, 360	Klamath	None	Tergital #7	Irreg.		sang. lobbi lac.	8-15	294-296	3
30	Ammonium - 1,440, 720, 360, 180	Rogue River	None	Tergital #7	1/4	10	lac. bract.	8-19	297-300	4
31	Ammonium - 1,440, 720, 360, 180	Rogue River	None	Tergital #7	1/2	10	sang.	8-20	305-308	4
32	Triethanolamine - 1,440, 720, 360, 180, 90	Stanislaus	None	None Tergital #7	1/2	10	roezli	8-1	217-226	5 5
33	Triethanolamine - 1,440, 720, 360, 180, 90	Stanislaus	Titanox B-30 Titanox AWD Titanox RC-HT-X	Tergital #7	1/2	10	roezli	8-6 8-8 8-8	254-268	5 5 5
34	Triethanolamine - 1,440, 720, 360, 180	Rogue River	None	Tergital #7	Irreg.		sang.	8-20	313-316	4
35	Sodium - 1,440, 720, 360, 180 + B. Napthoxyacetre - 375 + Na CO_3 - 1,500	Rogue River	None	Tergital #7	Irreg.	10	sang.	8-20	309-312	4
36	Ammonium - 1,440, 720, 360, 180 + B. Napthoxyacetre - 375	Plumas	None	Tergital #7	1/2	10	roezli	8-22	320-323	4
37	Sodium - 557 + Na ClO_3 - 3,000, 1,500, 750, 375	Stanislaus	None	None	Irreg.	10	roezli nev.	8-9	273-276	4
38	Ammonium - 720 + NH_4 SO_3 NH_2 - 3,000, 1,500, 750, 375	Stanislaus	None	None	Irreg.	10	roezli nev.	8-8	269-272	4
39	Butyl Ester - 8,240, 4,120, 2,060, 1,030 + Summer oil - 13,200	Stanislaus	None	None	1/2	10	roezli	7-30	199-202	4
40	Summer oil only - 26,400, 13,200	Stanislaus	None	None	1/2	10	roezli	8-9	277, 278	2
41	100% 2,4-D Acid - 188 (soaked 62 hours)	Stanislaus	Sodium Titanox B-30	None Tergital #7 None Tergital #7	1/2	10	roezli	7-30	195-198	4
42	Triethanolamine - 20,600	Stanislaus	None Titanox B-30	None Tergital #7 None Tergital #7		mist	roezli nev.	8-2	227-230	4
43	Butyl Ester - 32,000	Stanislaus	None S&W tracer	None Tergital #7 None Tergital #7		mist	roezli nev.	8-2	231-234	4
44	Butyl Ester - 32,000 + Summer oil - 364,000	Stanislaus	None S&W tracer	None Tergital #7 None Tergital #7		mist	roezli nev.	8-7	235-238	4
45	Butyl Ester - 32,000	Rogue River	None	None	1/2	heavy light heavy light	eryth. binom. visc.	8-19	301-304	4
46	Butyl Ester - 32,000 (Respray of part of plot 7)	Plumas	None	None	Irreg.	light	roezli	8-22	319	1
47	Triethanolamine - 20,600	Klamath	None	Tergital #7		light	lac. lobbi sang.	8-15	288	1
48	Triethanolamine - 20,600 (Respray of Ribes lacustre in 1945 plots 11 and 12)	Klamath	None	None		light heavy	lac.	8-15	292, 293	2
49	Dust - 5% Na. 2,4-D salt + 95% Frianite	Stanislaus	None	None	Irreg.	23¼#	roezli nev.	7-31	215, 216	2
50	Dust - 10% 2,4-D Acid (Dow S773) + 89% Frianite + 1% Acid	Stanislaus	None	None	Irreg.	7½#	roezli	7-31	213, 214	2
	Total Plots							May - Sept.	101-333	233

Although little difference in final kill showed up for the four 2,4-D compounds tested, the speed of action varied considerably. The butyl ester acted most rapidly followed in order by triethanolamine, ammonium salt, and sodium salt. Ribes in full sun were affected sooner than those in part or full shade.

The combination of butyl ester and sulphur resulted in curdling of the sulphur and consequent plugging of screens and strainers. However, the bush kill was not lessened.

Desert Whiting (calcium carbonate) appears to have slightly reduced the toxicity of the spray solution, though a positive statement of the incompatibility of 2,4-D and $CaCO_3$ cannot be made at this time.

RECOMMENDATIONS FOR CHEMICAL WORK in 1947

Chemicals.

The four proprietary 2,4-D materials, butyl ester, and triethanolamine, ammonium and sodium salts, are effective in killing *R. roezli*. At present butyl ester is the most expensive and triethanolamine the least expensive of the proprietary 2,4-D compounds. The ammonium and sodium salts are about equal in price and are intermediate in cost. These two salts, being dry water soluble powders will probably be the most convenient to use in the field. For practical work in 1947 it is recommended that the sodium, ammonium, and triethanolamine salts be purchased in about equal quantities.

Titanium dioxide paint pigment in a finely ground form is satisfactory as a marker in the spray. A mixture of 30 percent titanium oxide and 70 percent barium sulfate, sold under the trade name of "Titanox B-30", was very satisfactory when used at a 1:400 ratio, or 1 1/2 pounds per 100 gallons of water. Indications are that Titanox is compatible with 2,4-D and without effect on the herbicidal activity.

Under most conditions the 2,4-D sprays can be used without the addition of a wetting agent. Since some species and/or growth forms of ribes are more difficult to wet than others, it is advisable to have a spreader or wetting agent for addition to the spray when needed. Tergitol #7 proved satisfactory when added at the rate of 1/2 to 1 fluid ounce per 100 gallons of spray.

Methods.

Sprays should be applied as fine droplets or a coarse mist at pressures of from 100 to 300 pounds per square inch, depending on the ribes bush size and proximity of other vegetation. The higher pressures produce a finer spray and consequently more drift. With seedlings and small bushes of about 5 feet of live stem, a pressure of 100 p.s.i. or less is adequate. In the case of very large bushes with dense masses of foliage and fruits, considerable pressure is required to drive the spray into the center of the bush. Often a nearly solid stream of spray at high pressure is necessary for effective coverage of the innermost leaves and for treatment of the crown of the bush.

At present complete coverage of all leaves and live stem plus some wetting of the crown is recommended. Final check of 1946 work may indicate that crown treatment is unnecessary.

The nozzle-men usually work between string lanes and cover the ground in a systematic manner. When the ribes are confined to disturbed areas along roads and skidways, string lanes are often unnecessary. Also in large patches of solid ribes, string lanes can often be dispensed with.

For work close to the spray rig (100-400 feet) a small caliber (3/16") hose is used, each nozzleman being supplied direct from the pump manifold or from a short length of larger hose. For work at a considerable distance from the supply base a larger caliber main line (1/2 or 3/4") is laid and the nozzle-men draw from the main line at intervals of 100 feet.

The amount of searching time permissible by the nozzlemen is a debatable question and will have to be worked out in future studies. The use of clean-up men during or following spraying and with picks or back pack sprayers will be studied in 1947.

Equipment.

The equipment used should, as far as possible, fill three requirements, namely: (1) Durability. It should stand up under continuous use. (2) Portability. It should be as light as possible and of such shape to lend itself to mountain use. (3) Suitability. It should be adequate to perform the desired work.

For truck-mounted sprayers, a positive-displacement reciprocating-plunger high-pressure orchard pump of about 20 gallons per minute capacity will serve admirably providing the weight is not excessive. The power plant should be ample to perform a full season's work with a minimum of repairs. A tank capacity of from 300-400 gallons will provide enough spray solution to last for over an hour under most working conditions. Mild agitation in the tank can be performed mechanically or by bypassing a portion of the solution from the pump. A 1 1/2-ton 4-wheel drive truck will handle a 400-gallon tank, pump, engine, and 2,500 feet of hose.

Hose should be as small as possible and still not run up excessive friction losses when considerable lengths are used. Working pressures will vary from 100 to 600 pounds; consequently the hose should be of the high-pressure type, but not excessively stiff or heavy.

The truck-borne units for use in California will consist of a spray truck and a supplemental tank truck for transporting water. The spray unit will consist of a 1 1/2-ton 4x4 truck, 400-gallon steel tank, 20 gals.per min. at 800 p.s.i. capacity pump driven by a suitable power plant, 1200 feet of 1/2" high-pressure hose fitted with Hansen "5000 Series" couplings, 1600 feet of 3/8" high-pressure hose fitted with Hansen "3000 Series" couplings, 4 short orchard spray guns, 4 spray rods with nozzles and cut-off valves, and miscellaneous Y's and T's for hose hook-ups. The tank, pump, and power plant will be mounted on the frame of the truck with suitable heavy wire mesh baskets for carrying hose, guns, tools, and chemicals. The supply tank unit will consist of a 1 1/2-ton truck with a 400-gallon steel tank and 2 Pacific Marine portable pumpers or the equivalent for tank filling and water transfer.

SECTION II. ECOLOGY OF THE RIBES ASSOCIATED WITH SUGAR PINE. A GENERAL STATEMENT.

Introduction

The purpose of this report is to provide a general statement of results from a study of ribes ecology which has been in progress in northern California and southern Oregon for the past decade. This statement should facilitate an understanding of the occurrence, establishment, and growth of ribes on sugar pine lands, and provide a basis for the correlation of ribes eradication practices with the findings of ribes ecology. Most ribes ecology work in the Pacific Coast Region has been concerned with _Ribes roezli_ Regel, the Sierra Nevada gooseberry. This highly variable and exceedingly vigorous plant species constitutes the bulk of the ribes eradication problem in sugar pine forests south of Mt. Shasta. In this report, California and Oregon species of ribes other than _R. roezli_ will be given only brief attention.

Some ecologic generalizations expressed herein are drawn merely from field observations, but most of them result from summarization and analysis of data collected from a series of ribes ecology plots scattered from Shaver Lake (Fresno County, Sierra N.F.) to Lake Almanor (Plumas County, Plumas N.F.) Many of the plots were initiated in 1936 and 1937; some were started as recently as 1940. There are two main types of plots. The first type is concerned with regeneration of ribes plants and ribes populations subsequent to the removal of ribes, (a) from 8 one-acre plots located on representative forest areas, (b) from 37 sq.-chain plots in dense brush, (c) from 4 fenced exclosures with unfenced controls, and subsequent to (d) fire (5 plots), (e) logging (5 plots), The second type of plot is concerned with the occurrence, persistence, growth, and fruiting of ribes seedlings and seedling-origin plants on areas presumed to be representative of various aspects of ribes ecology. This second type is represented in the field by about 75 small plots aggregated into 10 series or groups.

Basic Ecologic Considerations

The theory of vegetational succession is important in any consideration of ribes ecology. This theory, as it pertains to forest vegetation, is concisely discussed by Baker (Baker, F. S. --Theory and Practice of Silviculture, McGraw-Hill, 1934) and might be reviewed at this point. Of particular ecologic interest is the so-called "law of limiting factors," or Liebig's "Law of the Minimum," which should be kept constantly in mind in any thinking on ecologic problems. One statement of this principle, quoted by Baker (cited above), is: "When a process is conditioned as to its rapidity by a number of separate factors, the rate of the process is limited by the pace of the 'slowest' factor." Another statement by Baker (cited above), is: "Factors are important when present in critical concentration, when almost any factor may assume an enormous importance, far outweighing all others." For example, it makes little or no difference how much usable nitrogen there is in a soil if the soil is too dry to maintain plant growth.

Quality of a forest site, or simply site as silviculturists use the term, has a great deal to do with the rate at which an area develops through the succession of stages of vegetation from the pioneer state towards climax forest vegetation. Primary and secondary successions are discussed by Baker (cited above). The development of vegetation through primary successions is much slower than the development of vegetation through secondary successions. The most important difference between primary and secondary successions is that a secondary succession takes place on a well developed, more or less mature soil profile while a primary succession develops on a very immature soil profile. At the start of a secondary succession the vegetation has been denuded, but the soil profile approaches the condition under climax vegetation for the same site. Development of vegetation through secondary successions on poor sites is slower than on good sites, for similar reasons. Secondary successions are of outstanding importance in sugar pine forests because of logging and fire. Site, and the degree of vegetational development towards climax forest, often vary greatly within small distances in sugar pine forests. Perhaps the most satisfactory way to consider sugar pine and ribes habitats is to think of them as complex mosaics of small varying ecologic niches.

Plants that tend to occur only in the pioneer stages of vegetational successions are said to be pioneer plants. Such plants may be contrasted with shade-tolerant plants, or more briefly with the tolerants. Pioneer plants may be divided loosely into primary pioneers and secondary pioneers, depending upon the type of succession in which they are most commonly found. Secondary pioneers, when growing in the pioneer stages of secondary successions, often show remarkable vegetative and reproductive vigor. Seeds of secondary pioneers in sugar pine forests may be expected to be long-lived, on the somewhat teleological theory that for such species to survive, some seed must remain viable throughout the climax stage of vegetation on an area, that is, from one pioneer stage to another.

There are many degrees of tolerance and lack of tolerance. Some pioneer species may be crowded out of vegetation in which other pioneer species may persist, but mature individuals of pioneer species may be expected to persist in vegetation long after establishment of new seedlings of the same species has virtually ceased.

Sugar pine forests are subjected to heavy winter precipitations of snow, and to long dry periods during the growing season. The total annual precipitation in sugar pine forests appears quite favorable to plant growth, but availability of soil moisture during the latter part of the growing season is often limiting. The distribution of precipitation over the year is unique. For example, at Lake Eleanor less than 15 percent of the total average annual precipitation occurs in the six months of May-October inclusive, and less than 5 percent occurs during the four major growing-season months of June to September.

The physiographic aspect of an ecologic niche is of great importance in the Sierra Nevada. Outstandingly good forest sites occur frequently, perhaps always, where air currents during storm periods--currents normally from a southwest direction because of the usual west-to-east course of storm tracks to the north--are forced up steep gradients towards the top of the range. The rate at which air currents gain altitude largely determines the amount of precipitation and humidity.

Because of the type of precipitation pattern, depth and physical properties of the soil mantle of ecologic niches are of great importance. Winter snow-pack as it melts in the spring usually saturates the whole soil mantle. Water then held in the soil constitutes a bank account of water for plant use, to which no appreciable deposits of moisture are made until the late fall or early winter. Deep, well-developed, fine-sandy soils, particularly if there is some sub-surface drainage from higher terrain, support outstanding forest vegetation, but shallow rocky soils result in practically desert areas.

General Ribes Biology

The genus *Ribes* is well represented in western North America. Some species, for example *R. cereum*, are remarkably widespread and abundant. Other species such as *R. tularense*, are closely restricted in range. There is on the Pacific Coast what plant taxonomists call a "center of distribution" of the genus *Ribes*. This implies a large number of aggressive and genetically variable species, and developing groups of species. Examples of other genera with similar centers of distribution are *Ceanothus* and and *Arctostaphylos*, genera which likewise are aggressive and relatively omnipresent in the natural vegetation of the Pacific Coast.

Individual ribes plants are self-sterile, viable seeds resulting only from cross-pollination. As eradication of ribes progresses, and as fruiting bushes become fewer, smaller, and farther apart, self-sterility will result in production of progressively fewer seeds.

Ecologic Classification of Ribes Species

For purposes of generalization, and for practical field application of ribes ecology in the control of white pine blister rust, ribes species of northern California and southern Oregon are segregated into the following ecologic groups.

1. Primary Pioneers, or Severe-Site Pioneers. Ridge tops and rock outcrops are examples of the sites in which species of this category are often found. Insufficient soil moisture, excessive insolation, and sometimes insufficient soil nutrients, are often limiting factors to plant growth in such habitats. The severe type of habitat in which these species are usually found remains more or less constant for relatively long periods of time. Seedling regeneration of ribes in these habitats might well continue for long periods of time, but seedlings would not be expected to be particularly abundant or vigorous. The list of species follows: *R. californicum*, *R. cereum*, *R. cruentum*, *R. erythrocarpum*, *R. goddingi*, *R. lasianthum*, *R. montigenum*, *R. quercetorum*, and *R. velutinum*.

2. Secondary Pioneers, or Mature-Soil Pioneers. Forest areas after fire or logging are examples of sites in which species of this category are most frequently found. On such disturbed areas, vegetation is destroyed or much degraded, but soil profile is relatively little degraded. The two ribes species in this category (*R. lobbi* and *R. roezli*) grow and fruit with astounding vigor on burns and heavily logged areas, but are not tolerant. They lose their vigor as other vegetation develops and competes with them for space, light, soil nutrients and soil moisture. Speed with which

vegetative cover--coniferous reproduction in particular--develops and changes an area from the pioneer state of vegetation to a more climactic state largely determines the duration and difficulty of the control problem for these two species.

3. Upland Shade-Tolerant Ribes. Species included hereunder are R. amarum, R. glutinosum, R. howelli, R. marshalli, R. menziesi, R. nevadense, R. sanguineum, and R. viscosissimum. These species occur most frequently in moist or cool sites, for example on northerly slopes, but they are often able to get along satisfactorily on relatively dry sites if in considerable shade. The preferred habitats, or ecologic niches, in which these ribes species are normally found are in general of much more permanent nature than the pioneer habitats mentioned under 1 and 2 above. Vigor and abundance of seedlings of these several species, when compared with R. lobbi and R. roezli, are relatively low, but such regeneration, because of the degree of tolerance of the species, may cause difficulty for longer periods of time.

4. Stream-Type, Shade Tolerant Ribes. Species included in this group are R. aureum, R. binominatum, R. bracteosum, R. divaricatum, R. inerme, R. klamathense, R. lacustre, R. petiolare, R. triste, and R. tularense. These species are more or less confined to stream banks, wet flats or slopes, or to seepages. Because these ribes are tolerant of shade and of other environmental conditions in dense vegetation, and because ecologic niches in which they normally occur are often permanent parts of forested lands, these species tend to remain more or less permanently in forest vegetation. These species sometimes offer extreme difficulties to hand eradication because of numerous layering stems and intergrowth with other brushy plants, but if very carefully removed, often cause no serious seedling regeneration problem.

Life Cycle of Ribes roezli

Ribes roezli Regel, the Sierra Nevada gooseberry, is widespread and abundant in sugar pine forests. This one species constitutes perhaps 90 percent of the ribes eradication problem in the Sierra Nevada. The species produces great numbers of seeds which are disseminated by rodents, by gravity, by water during run-off periods, and perhaps also by birds. The seeds have excellent viability; germination in the laboratory of 90 to 95 percent is common. Under favorable conditions of storage the seeds are long-lived. Viable gooseberry seeds have been recovered repeatedly from samples of soil and duff which were collected from ribes-free ecologic niches in sugar pine stands.

Gooseberry seedlings sometimes occur in disturbed forest areas in great abundance, and over considerable periods of time. For example, 900 current-season gooseberry seedlings were observed on a one-acre plot in 1946, 21 years after logging and 16 years after initial ribes removal. This one-acre plot was initiated in 1930 near Cow Creek G.S., Stanislaus N.F., on an area which was logged in 1925, and which has been kept largely free of fruiting gooseberries since initiation. A milacre plot (1/1000 of an acre) established in 1938 on Chowchilla Mt., Sierra N.F., on an area logged in 1928-29, from which ribes were first removed in 1935, has produced to date some 6380 current-season gooseberry seedlings. All seedlings are removed each spring from plots of this type. The number of seedlings removed

each spring from plots of this type. The number of seedlings removed from this milacre by years is as follows: 1938 - 3112, 1939 - 2120, 1940 - 586, 1941 - 292, 1942 - 179, 1943 - 42, 1944 - 27, 1945 - 7, and 1946 - 16. Other similar plots, particularly if located where large populations of gooseberries were not permitted to develop prior to initiation of ribes eradication, have shown much less intensity of seedling occurrence.

Seedling occurrence is the first stage in the important ecologic process called colonization. For R. roezli a more critical stage in colonization is seedling survival and establishment. Little practical importance need be attached to gooseberry seedlings which are unable to become established in an ecologic niche because of density of other vegetation. Very different degrees of seedling survival and establishment on different areas are to be expected from a secondary pioneer such as R. roezli, depending particularly upon degree of development of general vegetative cover, and wide variations have been observed in data collected from assorted seedling-survival plots. Growth rate of established seedlings follows much the same trend as seedling survival.

Survival, establishment, and growth of gooseberry seedlings are largely dependent upon the state of associated vegetation, but also somewhat dependent merely upon the length of time after logging or other disturbance. That is, an area is not so good an R. roezli habitat 10-15 years after logging as an equally open area just after logging.

Vigor and growth of R. roezli plants on disturbed areas seem largely proportional to available space and soil moisture. Astounding rates of growth have been observed on sites of excellent quality denuded by logging or fire. For example, a 4-year-old gooseberry plant collected on August 1, 1938, in Devil's Gulch just west of Chowchilla Mt., Sierra N.F., had 253 linear feet of live stem. Towards the other extreme of growth are repressed bushes occasionally found in dense brush which average only an inch or so of live stem per year of age.

Fruiting characteristics of R. roezli are of particular interest in that one prime objective of ribes control programs is to prevent reseeding of control areas once eradication work has been started. Under conditions most favorable to ribes growth, populations of seedling-origin gooseberries may produce appreciable quantities of fruit when only 3 or 4 years old. Enormous quantities of seed may be produced when such populations are 5-8 years old.

Practically all seeds produced by small vigorous populations of gooseberries surrounded by relatively undisturbed vegetation may be destroyed by rodents. The ribes on a small burn in well developed forest may be cited as an example of this condition. Similarly, when there are a few fruiting gooseberries in a waning ribes population in well developed vegetation, practically all seeds may be destroyed. An instance of the first sort has been observed on a small burn (area about 1.5 acres) in virgin timber on plot MC#12 of the California Forest Experiment Station, near Cow Creek G.S., Stanislaus N.F. There have been fruiting gooseberry bushes on this plot since 1941, but very few seeds have been added to the soil. Chipmunks, probably also mice and ground squirrels, have consumed practically all the fruits produced on this small area. Seeds of ribes fruits consumed by rodents are destroyed by mastication, but rodents almost always leave a few undestroyed seeds in the debris of consumed fruits. Thus rodents

disseminate gooseberry seeds as well as destroy them.

Pioneer shrubs, such as *R. roezli*, tend to be crowded out of vegetation by taller or more tolerant plants. Old gooseberries will persist for years in vegetation after the establishment of "new" gooseberry seedlings has been precluded by type and density of plant cover. The all-age mixed-species forest in which sugar pine normally occurs is not of marked over-all density, and it doesn't take much of an opening to encourage a gooseberry. Consequently mature gooseberries are only slowly crowded out of sugar pine forests, but the theory of their disappearance with forest development is perfectly plausible. A good example of the crowding out of *R. roezli* from developing forest has been observed on a one-acre plot just east of Blue Canyon, Shaver Lake area, Sierra N.F. In 1939, at the initiation of this plot, a number of ribes, each of which had once supported several hundred feet of live stem, were represented by rosettes of dead canes around dead or decadent crowns. This area, said to have been logged in 1914 and burned immediately thereafter with a slow creeping fire, now supports an excellent stand of sugar pine and white fir poles. If the signs on this particular area are read correctly, coniferous reproduction killed ribes largely by competition for soil moisture or soil nutrients, rather than primarily by competition for light.

Specific Disturbances, and *Ribes roezli*

Disturbance of any sort favors the occurrence, establishment, and growth of pioneer plants such as *R. roezli*. Any destruction of competing plants, in addition to increasing space and light makes more soil moisture available, because most of the water which would have been transpired by the destroyed vegetation remains in the reservoir of soil moisture.

Effects of fire upon vegetation in general, and upon *R. roezli* in particular, vary enormously with intensity of burn. Many gooseberry seeds stored in duff and soil are destroyed in any burn on forest land. A slow creeping fire--one which incompletely consumes the duff and kills no mature trees--tends to cause immediate appearance of relatively large numbers of gooseberry seedlings of subsequent slow growth. The lack of gooseberry vigor is due to competition from plants, especially trees, which survived the fire. Hot, crowning fires which kill all plants and which reduce much plant material to ashes may cause appearance of fewer gooseberry seedlings, but those that do appear grow with astounding rapidity, because of little or no competition from plants surviving the fire. As far as pioneer plants are concerned, perhaps the most important effects of fire on forest soil are (1) greatly to enrich the soil with mineral nutrients from ashes of consumed plant material, and (2) to make soil moisture much more abundant. This is because so few plants are drawing water out of the soil reservoir after the fire for use in transpiration. After all fires, but particularly after severe fires, all seedlings of *R. roezli* that are going to appear as a result of the disturbance tend to occur in a single crop. Almost all gooseberry seedlings occur the first spring after the burn. This is very different from the mode of occurrence of gooseberry seedlings after severe logging disturbance, in which case seedlings continue to appear for many years.

To recapitulate and to point up the discussion of fire in relation to ribes ecology, it is suggested that controlled "slow creeping" fire, particularly on logged areas, would simplify the problem of ribes eradication for the following reasons.

1. Fire opens and clears an area by a reduction of logging debris, brush, etc. Movement of ribes eradication crews is expedited. Ribes plants are more easily, more rapidly, and more surely found, and often are more easily removed than on comparable unburned areas.

2. Many ribes seeds stored in forest duff and soil are destroyed by fire.

3. Ribes regeneration from seed on burned, but otherwise undisturbed, areas is often exceedingly vigorous, but of short duration. Control of ribes populations on burns can be a simpler and shorter problem than control on comparable unburned areas.

4. The relatively rapid development of competing vegetation on burns tends to shorten and alleviate ribes control problems.

All types of logging increase ribes control problems, more or less in proportion to amount of vegetation destroyed and amount of soil disturbed. The chief differences in ribes seedling regeneration on logged and on burned areas are presumed due to the manner in which seeds come to be distributed in duff and soil during the two disturbances. Little soil is disturbed during fire, except on fire lines, etc. Soil- and duff-stored seeds, if not destroyed, tend to be uniformly brought up towards the post-burn surface by consumption of duff by fire. In logging operations uncomplicated by fire, large amounts of soil and duff are disturbed, pushed around, and variously mixed and piled, but not consumed. Some seeds are left near the surface in conditions conducive to germination, and germinate more or less immediately, but many are buried more deeply than before the logging disturbance. As time passes the mounds of soil and duff, and debris wear down under erosive influences, and viable ribes seed come gradually to lie in positions permitting germination. Conditions on areas burned just subsequent to logging are somewhat intermediate between conditions on areas logged but not burned and on areas burned but not logged.

Average growth-rate of seedling-origin ribes on logged areas varies greatly with type of logging, that is, with the amount of destruction of vegetation and disturbance of soil, and with the length of time after logging. An individual ribes bush occupies little space, and ecologic factors often vary rapidly within short distances. Thus, due to micro-ecologic factors, growth rates of individual ribes are highly variable on seemingly uniform areas. Because of the urgent need to prevent fruiting of ribes on control areas, the most vigorous and first-fruiting ribes must largely "set the pace" for eradication reworkings.

Grazing presents two aspects. Grazing favors pioneer plants such as R. roezli by reducing competition from browsed plants other than ribes. Against this effect must be balanced the effects of reduction of ribes themselves by grazing. Disturbance of soil by cattle favors seedling occurrence, but especially on slopes, cows kill some ribes seedlings and small

bushes by trampling and by tearing plants out of the soil. Data from a series of exclosure plots indicate that (1) the occurrence of current-season gooseberry seedlings and the establishment of seedling-origin ribes plants have been reduced faster inside the fence than outside, that (2) individual surviving ribes have grown faster outside the fence, and that (3) after 5 to 6 years of grazing exclusion, total ribes live stem outside the fence greatly exceeds that inside the fence, but that (4), in general, smaller and younger bushes have fruited inside the fence. Intensity of grazing, type and degree of vegetational development, topography, and type of soil and soil profile apparently must be evaluated before the over-all effect of grazing on ribes ecology can be estimated.

The common method of removing ribes from control areas involves the use of pick- or claw-mattocks, and consequently involves considerable soil disturbance. When large ribes are eradicated from associated brush or other dense vegetation, considerable disturbance is caused to vegetation other than ribes. These disturbances produce sites more favorable for ribes regeneration and growth. The writer has seen instances in which disturbance incident to ribes eradication has favored ribes regeneration, but in general, because of more important concurrent ecologic factors, this tendency seems to be of no great practical significance.

Eradication of ribes with chemicals is often of enormous advantage. One kind of bush which is much more easily sprayed than dug, for example, is the large over-mature bush of the rosette type (with many spreading canes close to the ground). The main crown of this type of bush is often protected by a sort of "defence in depth" of subsidiary crowns of layers, and the compound bush is difficultly eradicated by the usual hand methods. R. roezli is quite susceptible to the recently developed herbicide, 2,4-D (2,4-dichlorophenoxyacetic acid), and this chemical promises to revolutionize field methods for control of concentrations of this species.

Chemical methods resolve many of the problems of control of R. roezli and of other susceptible species, but there are two important problems of ribes eradication which current chemical-control methods do not clear up. Chemicals cannot be expected to kill all gooseberry seeds stored in duff and soil under treated bushes, and seedling regeneration can be expected on chemically treated areas. And, while chemicals as currently used may kill all susceptible ribes to which they are carefully applied, they obviously cannot be expected to "find" gooseberries scattered in other vegetation. That is, gooseberries must still be found by looking for them.

As eradication of ribes from any area progresses towards maintenance conditions, and as associated vegetation thickens with development, more and more time, both proportionately and actually, must be spent in finding ribes. The proportion of looking time to digging time increases rapidly with repeated workings. Ribes become fewer, smaller, and more obscured by other plants, and the law of diminishing returns poses a whole family of problems relating to time of working, type of labor, training of labor, methods of work, etc. The solution of this group of problems, concerned basically with ecologic and pathologic effects of small and missed ribes, and related directly to costs, will be the subject of much thought for some time to come.

Conclusion

From the ecologic viewpoint it is becoming increasingly apparent that there are two propitious times for initiation of ribes control work in the Sierra Nevada and southern Cascade Mountains.

Perhaps the best time to start eradication of ribes from sugar pine forests is immediately after severe disturbance, that is, immediately after logging or fire. Advisability of starting at this ecologic stage, especially on burns, is based on absolute control of fruiting. To prevent the very rapid growth and vigorous fruiting of long established, but previously repressed, ribes which survive logging, one working of mature timber prior to logging is often desirable. If no ribes are permitted to fruit on recently disturbed areas, the following comments on conditions just after the disturbance may be offered:

1. All ribes regeneration will result from duff- and soil-stored seeds, that is, from old seeds. Certainly these old seeds can be expected to be relatively few in number, and to have lower viability and less longevity than new seeds that might be added to an area after the disturbance.

2. Ribes regeneration from soil-stored seed may be vigorous at times but there are many indications from ecologic studies that duration of such seedling regeneration will be relatively short, especially on burns.

3. Areas are relatively open just subsequent to disturbance. Eradication crews can move easily across the land. Ribes will be more easily seen, will average of younger age and of smaller size, and most likely will be more easily eradicated than on areas of well developed vegetation. As vegetation thickens on a control area, ribes are more difficult to find and missed bushes can be expected to increase in number and size.

4. The great majority of ribes will be young, discrete bushes. There will be no over-mature bushes protected by the "defense in depth" of semi-buried stem and rooted layers described above.

5. Few ribes will be growing intertwined with other shrubs.

A second propitious time to initiate ribes eradication, and perhaps the time when ribes control is easiest and least expensive, is after forest vegetation has been undisturbed by fire or logging for a considerable number of years. This choice is predicated on two conditions, (1) that delay in ribes eradication will not result in significant rust damage to pine, and (2) that the ribes population will have passed through its grand period of growth. Vegetation in general, and coniferous reproduction in particular, must have occupied the area rather completely. The period of active establishment of appreciable numbers of ribes seedlings must have passed. Under these conditions the following comments apply:

a. Control of ribes is based on pressure of plant competition, not on absence or near absence of viable ribes seeds. Any disturbance to areas of this sort may suddenly change ecologic conditions, and as suddenly make ribes control much more difficult.

b. Fruiting of ribes on areas of this sort is not of critical importance. Control is based on the inability of ribes seedlings to become established in existing vegetation, not on the absence of ribes seeds.

c. The advanced stage of vegetation often makes ribes plants hard to find and hard to remove. The problem of missed bushes may become acute.

d. The protection of mature timber, as in National Parks, is a special case of this kind.

As a final comment it may be remarked that there is one most unfavorable time to initiate ribes control. Ordinarily ribes eradication should not be initiated a few years after a severe disturbance, at a time when the ribes population and many individual ribes plants are in their grand period of growth. At such times numbers of ribes per acre are high, and ribes individuals are commonly large and vigorous. Ribes fruits are being produced in great profusion. The "wearing out" of viable seed stored in duff and soil will be a long and difficult process. Under these conditions general vegetation has not developed to a state where pressure of plant competition has any important slowing effect on ribes, and ribes seedlings become established in great numbers following initial and subsequent workings. The problem of close control of ribes under such conditions, if necessary because of pathologic considerations, may be expected to be most difficult and expensive.

SECTION III. LABORATORY, GREENHOUSE, AND SPECIAL ACTIVITIES

Principal laboratory and greenhouse activities related to the testing of 2,4-D in various concentrations and dosages and with several amendments serving as spreaders and markers. On the basis of these tests the butyl ester, triethanolamine salt, ammonium salt, and sodium salt of 2,4-D were selected for field tests and Titanox B30, Velvet White, Desert Whiting, and Sulfur as markers. Tergitol #7 was found to be satisfactory as a spreader. Summer emulsion oil appeared to improve toxicity of 2,4-D to resistant ribes such as _R. lacustre_.

Greenhouse tests on the susceptibility of ribes to 2,4-D showed the following species reactions:

1. _Highly susceptible to 2,4-D:_
   Ribes bracteosum, _R. petiolare_, and _R. roezli_.

2. _Moderately susceptible to 2,4-D:_
   Ribes nevadense, _R. cereum_, _R. sanguineum_, _R. viscosissimum_, _R. cruentum_, and _R. erythrocarpum_.

3. _Moderately to highly resistant to 2,4-D:_
   R. lacustre, _R. binominatum_, _R. lobbii_, _R. montigenum_, _R. tularense_, _R. inerme_, _R. glutinosum_, and _R. menziesii_.

Ribes in class 1 above were killed by application of aqueous 2,4-D to aerial plant parts in concentrations as low as 90 p.p.m. acid equivalent. Those in category 2 required a top spray of at least 750 p.p.m. and a supplementary crown treatment for satisfactory kill. Preliminary tests of butyl ester and triethanolamine concentrates showed that ribes in class 2 could be killed

by thorough coverage of leaves and stems by finely atomized concentrates (20,000 p.p.m.) of these chemicals. Ribes in class 3 were not significantly damaged by dilute aqueous sprays; some top damage was obtained with mixtures of summer oil and 2,4-D butyl ester concentrates, but further experimental work is needed to devise improved herbicides for class 3 ribes.

In cultures of R. roezli seeds treated with 2,4-D, data showed that (1) contact with 1,000 p.p.m. of the sodium salt of 2,4-D for 24 hours reduced viability of seed from 92 percent germination (in the control) to 14 percent, and (2) 200 p.p.m. of the same chemical for 48 hours prevented germination (0 percent).

Investigations were made of truck-mounted power spray rigs, of portable power sprayers, and of spray accessories such as hose, couplings, and nozzles in respect to the performance required of this equipment for practical field work.

Further progress was made in studying the germinative reaction of ribes and white pine seeds. Some changes are indicated in previously recommended methods for extracting ribes seeds from duff and soil samples to prevent loss of ribes seeds in the seed cleaning mill. Shop work was continued in the design of a machine for cracking western white pine seeds scheduled for direct seeding tests.

The following published papers or special research reports dealing with the above-mentioned subjects are recorded for the information of Blister Rust personnel.

Serial No. 131.
AN EFFICIENT SYSTEM FOR CULTURING LARGE NUMBERS OF SMALL SEEDS.
.....C. R. Quick

Serial No. 132.
ECOLOGY OF THE RIBES ASSOCIATED WITH SUGAR PINE. A GENERAL STATEMENT
.....C. R. Quick

Bureau MS 7711.
RAPID ESTIMATION OF THE PHYTOCIDAL ACTION OF CHEMICALS. Science 103: 474-476. 1946.
.....H. R. Offord

Bureau MS 8081.
CONTROL OF HOST PLANTS IN A PLANT DISEASE PROGRAM. Western States 8th Annual Weed Control Conference, pp. 39-43. Reno, Nev. Feb. 26-27, 1946.
.....H. R. Offord

CHEMICAL WAR WAGED ON BLISTER RUST. Timberman Vol. XLVII, No. 12, pp. 39, 74, 78. Oct. 1946.
.....George A. Craig